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*C&SF Comprehensive Review Study – Alternative C*

Component A6

Geographic Region: North of Lake Okeechobee

Component Title: Storage Reservoir (modified from Alternative 5 – operational change only) – SEE COMPONENT FIGURE 1

Purpose: To increase the capacity of the hydrologic system to better meet the water management objectives associated with flood protection, water supply and environmental enhancement. The additional water storage capacity allows for greater detention of water during wet periods for subsequent use during dry periods. It is also anticipated that this increased storage capacity will shorten the duration and frequency of both high water levels in the Lake that are stressful to the Lake littoral ecosystems, and large discharges from the Lake that are disruptive to the downstream estuary ecosystems.

Operation: Water from Lake Okeechobee is to be pumped into the north storage reservoir when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (14.35 feet - 14.75 feet NGVD; Figure 1). During the dry season, flows will be allowed back to the Lake from the reservoir when the Lake level is projected to fall to within three-quarters of a foot of the supply-side management line in the same dry season, or below 11.75 feet NGVD in the upcoming wet season. During the wet season, flow is allowed from the reservoir to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months and the Lake water level is either currently below 11.75 feet NGVD or projected to be in supply-side management during the upcoming dry season.

Design:

20,000 acres at 10 feet maximum depth

Inflow pump capacity = 4800 cfs

Outflow structure = 4800 cfs

Location: To Be Determined – Specific site not necessary for Water Management Model simulation  
Counties: Glades, Highlands, Okeechobee, Osceola, and Polk

Assumptions and related considerations:

- 1) Uncertainty in land availability
- 2) An alternative to capturing Lake water would be to attenuate flood waters before reaching the Lake. This could be done north of the Kissimmee River which could have positive impacts to the Kissimmee River Restoration Project or

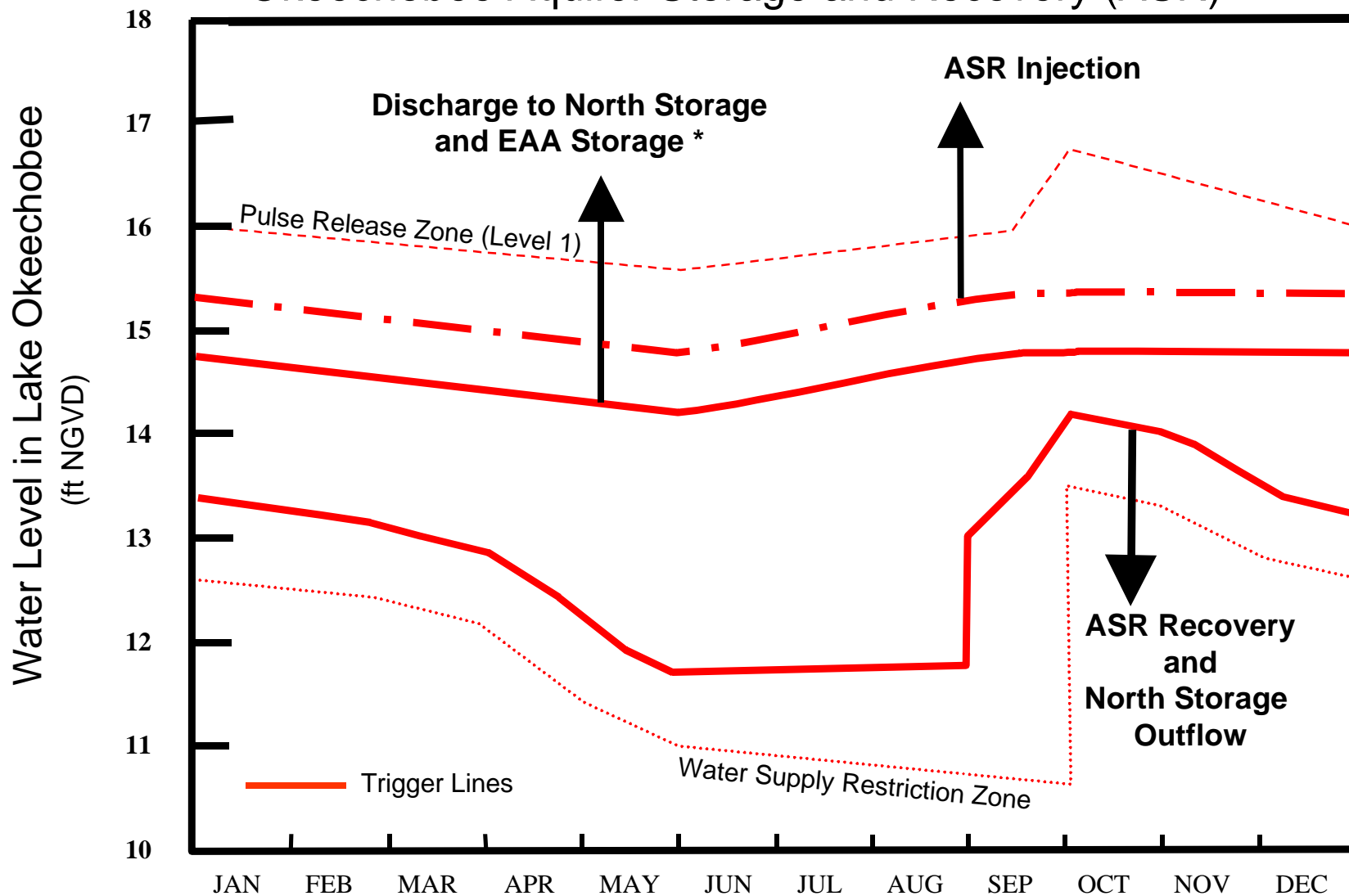
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within the Taylor Creek/Nubbin Slough which would improve water quality entering the lake.

- 3) Potential increase in stage duration of Lake Okeechobee.
- 4) Potential decrease in maximum stages of Lake Okeechobee.

Figure 1. Trigger Lines for North of Lake Okeechobee Storage and Lake Okeechobee Aquifer Storage and Recovery (ASR)



\* Discharge to North and EAA Storage if Lake Okeechobee stage is forecasted to be above "Discharge to ...Storage" line, or if stage is above Pulse Release Zone (level 1) line.

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Component B2

Geographic Region: St. Lucie/C-44 Basin

Component Title: Storage Reservoir (same as Alternative 2)

Purpose: Storage reservoir to capture local runoff from C-44. The reservoir will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary.

Operation:

Inflows from C-44 basin runoff (and only when Lake stage is > 14.5 feet NGVD)

Design:

10,000 acres at 4 feet maximum depth

Inflow pump capacity = TBD (initially assumed to not constrain performance)

Outflow structure capacity = TBD (initially assumed to not constrain performance)

Location: To be determined – Specific site not necessary for Water  
Management Model simulation  
Counties: Martin

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loading to the estuary.

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Component C6

Geographic Region: St. Lucie/C-44 Basin

Component Title: Environmental Water Supply Deliveries to St. Lucie Estuary  
(modified from Alternatives 1, 2, 3, 4 and 5)

Purpose: To provide freshwater deliveries to the St. Lucie Estuary to protect and restore more natural estuarine conditions. For Alternative 6 the time series of estuary target flows was revised from the series used in Alternatives 1, 2, 3, 4 and 5. The target estuarine time series was revised because, under current policy, the C-44 basin does not discharge water to the St. Lucie estuary when Lake Okeechobee is below 14.5 feet NGVD and also because such discharges are generally undesirable from an estuarine management viewpoint. The time series used in the earlier alternatives did not reflect these considerations.

Operation: Deliver (revised) desired estuary target discharge through S-80 from the reservoir when water is available or from the Lake when the Lake stage exceeds 15 feet NGVD.

Design: Operational change only.

Location: C-44 and St. Lucie Estuary  
Counties: Martin and St. Lucie

Assumptions and related considerations:

- 1) Estuary deliveries are based on maintaining salinity conditions in the estuary to support a range of aquatic vegetation seagrass, invertebrates, and fish communities.
- 2) Reviewers are cautioned that having different time series of targeted estuarine releases in Alternative 6 makes it inappropriate to directly compare the results from this alternative with earlier alternatives. This problem will soon be resolved by rerunning and reposting alternatives to address this and other problems with consistency among the alternatives.

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Component D5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Storage Reservoir(s) with Aquifer Storage and Recovery (ASR)  
(same as Alternative 5)

Purpose: Storage reservoir(s) with ASR to capture basin runoff and releases from Lake Okeechobee. These facilities will be designed for water supply benefits, some flood attenuation, and to provide environmental water supply deliveries to the Caloosahatchee estuary.

Operation: Excess runoff from the C-43 basin and Lake Okeechobee flood control discharges will be captured by the proposed C-43 reservoir(s). Water from the reservoir(s) will be used to provide environmental deliveries to the Caloosahatchee Estuary, to meet demands in the Caloosahatchee basin and to inject water into the ASR wellfield for long-term (multi-season) storage. Water from the ASR facilities will be used to meet environmental demand of the estuary and meet basin demands. Any estuarine demands not met by basin runoff, the reservoir and the ASR system will be met by Lake Okeechobee, as long as Lake stage is above 15.0 feet NGVD. Lake water is also used to meet the remaining basin demands subject to supply-side management.

The C-43 reservoir is operated in conjunction with Component DDD5, the Caloosahatchee Backpumping Facility which includes an STA for water quality treatment. If the levels of water in the reservoir exceed 6.5 feet and Lake Okeechobee is below the pulse release zone (see Figure 1), then water is released and sent to the backpumping/treatment facility at 2000 cfs.

Design:

Reservoir(s) total of 20,000 acres at 8 feet maximum depth.  
ASR wellfields total of 44, 5-MGD wells

Reservoir(s) Inflow pump capacity = TBD (assumed not to constrain performance)  
ASR inflow capacity = limited to 220 MGD  
Reservoir(s) outflow structure capacity = TBD (assumed not to constrain performance)  
ASR outflow capacity = limited to 220 MGD

Location: TBD - Specific site not necessary for simulations

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Counties: Hendry, Glades, and Lee

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient loadings.
- 3) Raw water ASR injection permissible.
- 4) 70 percent recovery for injected ASR water.
- 5) Size of injection bubble not limited.
- 6) ASR facility sized to slightly exceed minimum flows to estuary.

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Component E5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Environmental Water Supply Deliveries to Caloosahatchee Estuary (same as Alternative 5)

Purpose: To provide freshwater deliveries to the Caloosahatchee Estuary to establish desirable salinity regimes at locations of key estuarine biota.

Operation: Deliver (revised) desired estuary target flow through S-79 in priority order, from basin runoff, from the C-43 storage reservoir, from the C-43 basin ASR system and from the Lake when the Lake stage exceeds 15 feet NGVD.

Design: Operational change only. For Alternative 5 the time series of estuary target flows was revised from the series used in Alternatives 1, 2, 3 and 4. The revised series changes the timing and total amounts in a way that assures that desirable salinity patterns will be achieved and at the same time makes some water available for capture and utilization in the regional system. The capture of the excess runoff is accomplished in Alternative 5 by the Caloosahatchee Basin Reservoir and ASR system (component D5) and by a new component, Caloosahatchee Backpumping with Stormwater Treatment Area (component DDD5).

Location: C-43 and Caloosahatchee Estuary

Assumptions and related considerations:

- 1) Estuary deliveries are made to maintain salinity conditions in the estuary that support a range of aquatic vegetation, seagrass, invertebrates and fish communities.



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Component F3

Geographic Region: Lake Okeechobee

Component Title: Lake Okeechobee Regulation Schedule (same as Alternatives 3, 4 and 5)

Purpose: Operating criteria for Lake Okeechobee that includes flood control, water supply (including releases to the Water Conservation Areas to meet estimated natural system needs), and Lake littoral zone and estuary protection.

Operation: Use current regulation schedule (known as Run 25) with the exception of eliminating all St. Lucie and Caloosahatchee regulatory discharges (except emergency releases - zone A).

Design: Operational change only. Modify the regulation schedule by eliminating all but emergency discharges to both the St. Lucie and Caloosahatchee Estuaries.

Location: Within existing boundary of Lake Okeechobee  
Counties: Glades, Hendry, Martin, Okeechobee and Palm Beach

Assumptions and related considerations:

- 1) It is assumed that the implementation of other project components will reduce the frequency of high Lake stage events therefore reducing the need for regulatory releases to the St. Lucie and Caloosahatchee Estuaries.

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Component G5

Geographic Region: Everglades Agricultural Area (EAA)

Component Title: Storage Reservoir (same as Alternative B, except that compartment 2 of the reservoir will be divided into two 20,000 acre areas with new operational rules).

Purpose: Storage reservoir to: improve timing of environmental deliveries to the Water Conservation Areas including reducing damaging flood releases from the EAA to the Water Conservation Areas; reduce Lake Okeechobee regulatory releases to estuaries; to meet supplemental agricultural irrigation demands; and increase flood protection within the Everglades Agricultural Area. Conveyance capacity of the Miami and North New River Canals between Lake Okeechobee and the Storage Reservoirs are increased to convey additional Lake Okeechobee flood control releases that would have otherwise been discharged to the Caloosahatchee and St. Lucie Estuaries.

Operation: Inflows are from Lake Okeechobee regulatory discharges and runoff from Miami & North New River canal basins. The reservoir will be divided into three compartments.

Compartment 1: 20,000 acres, meets EAA irrigation demands only. The source of water is excess EAA runoff (inlet capacities for excess runoff (2700 and 2300 cfs, for the Miami Canal Basin and the North New River Canal Basin, respectively) and outlet capacities for EAA demands (3000 and 4400 cfs, for the Miami Canal Basin and the North New River Canal Basin)). Overflow to compartment 2A occurs when depth of water in compartment approaches 6 ft maximum and Lake Okeechobee regulatory discharges are not occurring or impending. Excess EAA runoff is diverted to this compartment (2A) ONLY if WCA-3A is too deep.

Compartment 2A: 20,000 acres, meets environmental demands as a priority, but can supply a portion of EAA irrigation demands if environmental demands equal zero. The sources of water are overflow from compartment 1 and Lake Okeechobee regulatory releases including the weather forecasting to initiate storage usage. Compartment 2A will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

Compartment 2B: 20,000 acres, meets environmental demands as a priority. The sources of water are overflow from compartment 1 and 2A and Lake Okeechobee regulatory releases only during the extreme wet events. Compartment 2B will be operated as a dry storage reservoir and discharges made down to 18 inches below ground level.

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The conveyance capacities of the northern reaches of the Miami and North New River Canals in the EAA are tripled (200% increase) for Lake Okeechobee regulatory releases as in Alternative 3. Structures with a capacity of 4500 cfs for diversion of regulatory releases through the Miami Canal and a capacity of 3000 cfs for diversion of regulatory releases through the North New River Canal are added for Compartment 2A and 2B. The flows will be delivered to the Water Conservation Areas through Stormwater Treatment Areas 3 and 4.

**Design:**

Compartment 1: 1-20,000 acre reservoir at 6 ft maximum depth

Inflow structure capacity: inflow pumps of 2700 cfs Miami Canal Basin and 2300 cfs North New River Canal Basin for diversion of EAA runoff

**Outflow structure capacity:**

To Everglades Agricultural Area: 1-3000 cfs structure to Miami Canal Basin and 1-4400 cfs structure to North New River and Hillsboro Basins (initially assumed to not constrain performance).

Compartment 2A: 1-20,000-acre reservoir at 6 ft maximum depth

Inflow structure capacity: inflow pumps of 4500 cfs and 3000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami Canal and the North New River Canal, respectively

**Outflow structure capacity:**

To Stormwater Treatment Areas 3 and 4: 3600 cfs @ 6 ft head.

Increase in Miami & North New River Canal capacities (200%)

To Miami Canal: 4500 cfs

To North New River Canal: 3000 cfs

Compartment 2B: 1-20,000-acre reservoir at 6 ft maximum depth

Inflow structure capacity: inflow pumps of 4500 cfs and 3000 cfs for diversion of Lake Okeechobee regulatory releases from the Miami Canal and the North New River Canal, respectively

**Outflow structure capacity:**

To Stormwater Treatment Areas 3 and 4: 3600 cfs @ 6 ft head.

Increase in Miami & North New River Canal capacities (200%)

To Miami Canal: 4500 cfs

To North New River Canal: 3000 cfs

**Location:** To be determined - conceptually located between Miami & North New River Canals for Water Management Model simulation purposes only.

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Counties: Palm Beach

Assumptions and related considerations:

- 1) Land Availability.
- 2) Modifications to Stormwater Treatment Areas if needed for Everglades water deliveries to meet the appropriate water quality.

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Component H6

Geographic Region: Water Conservation Areas and Everglades National Park

Component Title: Everglades Rain-Driven Operations

Purpose: Improve timing and location of water depths in the Water Conservation Areas (WCAs) and Everglades National Park (ENP).

The rain-driven operational concept is a basic shift from the current operational practice which uses calendar-based regulation schedules for the WCAs. Regulation schedules, also referred to as flood-control schedules, typically specify the release rules for a WCA based on the water level at one or more key gages. Regulation schedules do not typically contain rules for importing water from an upstream source. The schedules also repeat every year and make no allowance for inter-annual variability. The rain-driven operational concept includes rules for importing and exporting water from the WCAs in order to mimic a desired target stage hydrograph at key locations within the Everglades system. The target stage hydrographs mimic an estimate of the more natural (pre-drainage Everglades) water level response to rainfall.

Operation:

Note that for the description below, the term "trigger level" means the water level used to trigger action at an upstream or downstream structure. Trigger levels are related to the target stage hydrographs by simple offsets which typically range less than +/-1.0ft. There is usually one trigger level for the import rules; and two trigger levels associated with the exportation of water. The two export trigger levels define two release zones. The lower zone is a conditional release zone; so releases are made only if the downstream area has a "need". The upper zone is an unconditional release, or flood control, release zone; so releases are made in this zone even if the downstream area doesn't "need" the water.

WCA-1:

No rain-driven operations (use 1995 interim regulation schedule)

WCA-2 Import Rules:

Import water from Lake Okeechobee via STA-2 if water levels fall below trigger levels at either of the following locations:

- a. Northern 2A (SFWMM grid cell R45C28)
- b. 2A-17 gage

WCA-2 Export Rules:

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- a. Export water from WCA-2A to WCA-2B via S-144, S-145 & S-146, if levels at 2A-17 exceed trigger levels.
- b. Export water from WCA-2A via the S-11's if levels at 2A-17 exceed triggers.
- c. Export water from WCA-2B to ENP via new structures at south end of WCA-2B if levels at central WCA-2B (R36C30) exceed trigger levels.

**WCA-3 Import Rules:**

- a. Import water from EAA storage and/or Lake Okeechobee via STA-3/4 to:
  - (1) Northeast WCA-3A if levels fall below trigger levels at 3A-NE.
  - (2) Northwest WCA-3A (via L-5/L-4, S8, G404, and spreader along L-4) if levels fall below trigger levels at 3A-NW.
  - (3) Central WCA-3A, via an improved S-140 & a spreader along the southernmost ~8 miles of L-28 {north reach}, if levels fall below trigger levels at 3A-4.
- b. Import water from WCA-2A via S-11's if levels fall below trigger levels at 3A-3 (and WCA-2 has excess water {levels at 2A-17 significantly exceed targets}).

**WCA-3 Export Rules:**

- a. Export water from WCA-3A to WCA-3B via proposed L-67 weir structures if water levels upstream of weirs exceed their respective crest elevations (passive structures).
- b. Export water from WCA-3A to WCA-3B via proposed S-345 structures if average of water levels at 3A-28 and R33C26 exceeds trigger levels.
- c. Export water from WCA-3A to NWSRS via S12 structures if levels at 3A-28 exceed trigger levels.
- d. Export water from WCA-3A to central lakebelt storage area, via proposed gravity structure near S-9, if water levels at R26C33 exceed trigger levels.
- e. Export water from WCA-3B to central lakebelt storage area, via S-31, if water levels at R30C27 exceed trigger levels.

**ENP Import Rules:**

- a. Import water from WCA-3A via proposed S-345 structures if average of water levels at NESRS-1 and NESRS-2 falls below trigger levels.
- b. Import water from Central Lakebelt Storage via proposed S-356A&B structures if levels at G-1502 fall below trigger levels.
- c. Import water from WCA-3A to NWSRS via the S-12 structures if average of water levels at G-620 and P-33 falls below trigger levels.
- d. Import excess water from WCA-2B, via improved L-37 & L-33 canals and S-356A&B.

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Big Cypress National Preserve Import Rules:

- a. Import water from WCA-3A, via S-344 and the S343A&B structures, if average water levels (R22C13 & R26C13) fall below trigger levels, and if water levels at 3A-28 are significantly above trigger levels. Note that for this component (H), seasonal operations as defined in component HH3 restrict flows during January through June.

Design: Deliveries from upstream sources (EAA runoff, EAA storage area, and/or Lake Okeechobee) through the Stormwater Treatment Areas (STAs) prior to release into the WCAs. Distribution of STA outflow designed to improve hydropatterns. Flows to ENP from WCA-3B are uncontrolled in this alternative since the S-355 structures, L-29, and the L-29 borrow canal are removed to allow overland flow from WCA-3B to NESRS.

Location: Within the existing boundaries of the WCAs and ENP.

Counties: Broward, Dade, Monroe, and Palm Beach

Assumptions and related considerations:

- (1) Consideration given to tree islands and minimum floor levels consistent with SFWMD's proposed minimum flows and levels for these areas.
- (2) Potential increases in hydropatterns in relatively overdrained areas (e.g., northern WCA-3A) and decreases in hydropatterns in deep water areas (e.g., southern WCA-3A).

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Component I3

(not included in this Alternative)



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Component J  
(not included in this Alternative)

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Component K4

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: L-8 Project (modified from Alternative 3 to include the addition of 25 MGD of ASR capacity at Lake Mangonia) - SEE COMPONENT MAP 1

Purpose: Reduce water supply restrictions in the Northern Palm Beach County Service Area by capturing more of the annual discharges from portions of the southern L-8, C-51 and C-17 basins and route this water to the West Palm Beach Water Catchment Area (WPB WCA). Intent is to increase water supply availability and provide pass through flow to enhance hydroperiods in Loxahatchee Slough and increase base flows to the Northwest Fork of the Loxahatchee River.

Operation: Capture excess L-8, C-51 and C-17 basin water to meet urban water supply demands in the Northern Palm Beach County Service Area and enhance hydroperiods in the Loxahatchee Slough. Water would be diverted through the M-canal to the Water Catchment Area. Stormwater treatment areas will be provided to meet all water quality standards required if necessary.

Design:

- Add 25 MGD of ASR clusters at Lake Mangonia to provide water during regionally triggered droughts and as a means of reducing withdrawals from the WPB WCA when the water levels are substantially below the target hydrograph. During period when the WPB WCA is above 18.0 feet NGVD an additional (above the flow rate required to supply the water treatment plant) 25 MGD (39 cfs) will be sent to Lake Mangonia for subsequent storage through the ASR Clusters (surficial well discharging into a Floridan well). The ASR well will provide water directly to Lake Mangonia when water levels in the WPB WCA are within 0.2 feet of the level that triggers regional supply to the WPB WCA.
- Increase the pumping capacity from the L-8 Tieback into the M-Canal to 300 cfs to increase the volume of water captured from the southern L-8 canal and deliver it to the Water Catchment Area. This pump has dual purpose, 1) to capture L-8 basin runoff when available and 2) to deliver regional deliveries when needed.
- Assume that the Indian Trail Improvement District will adopt an operation plan which promotes water conservation by prioritizing discharge so that excess

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storm water is first offered to the City of West Palm Beach Water Catchment Area and secondarily discharged through off peak releases to the C-51 Canal via the M-1 Canal. For this alternative pumping from Indian Trail Improvement District into the M-Canal for subsequent discharge into the City of West Palm Beach Water Catchment Area will be assumed to occur under the following conditions

- When the City of West Palm Beach Water Catchment Area has sufficient need for imported water as defined by being below 18.2 feet NGVD.
  - When water levels in the Lower M-1 Basin exceed 14.0 feet NGVD during the wet season (June 1 through October 31) or 16.0 feet NGVD during the dry season (November 1 through May 31) the Lower M-1 Basin may discharge up to 200 cfs for subsequent storage.
  - When water levels in the Upper M-1 Basin exceed 15.0 feet NGVD during the wet season or 16.0 feet NGVD during the dry season) the Upper M-1 Basin may discharge up to 300 cfs for subsequent storage.
- Increase conveyance of the M-canal between the pump and the Water Catchment Area to accommodate the increased inflow from the L-8 Canal and the Indian Trail Improvement District.
  - Install a new structure in the south leg of C-18 just south of the west leg to facilitate better management of water levels and discharges from the Loxahatchee Slough. The new gravity structure would consist of a variable discharge up to 400 cfs and emergency overflow weirs.
  - 50 cfs pump for water supply deliveries to utilities.
  - New culverts under Bee-Line Highway for up to 100 cfs deliveries to Loxahatchee Slough.
  - Eliminate ASR component described in the Future Without Project Condition.

Location: Southern L-8 Basin including the Indian Trail Improvement District, West Palm Beach Water Catchment Area, and the Loxahatchee Slough  
Counties: Palm Beach

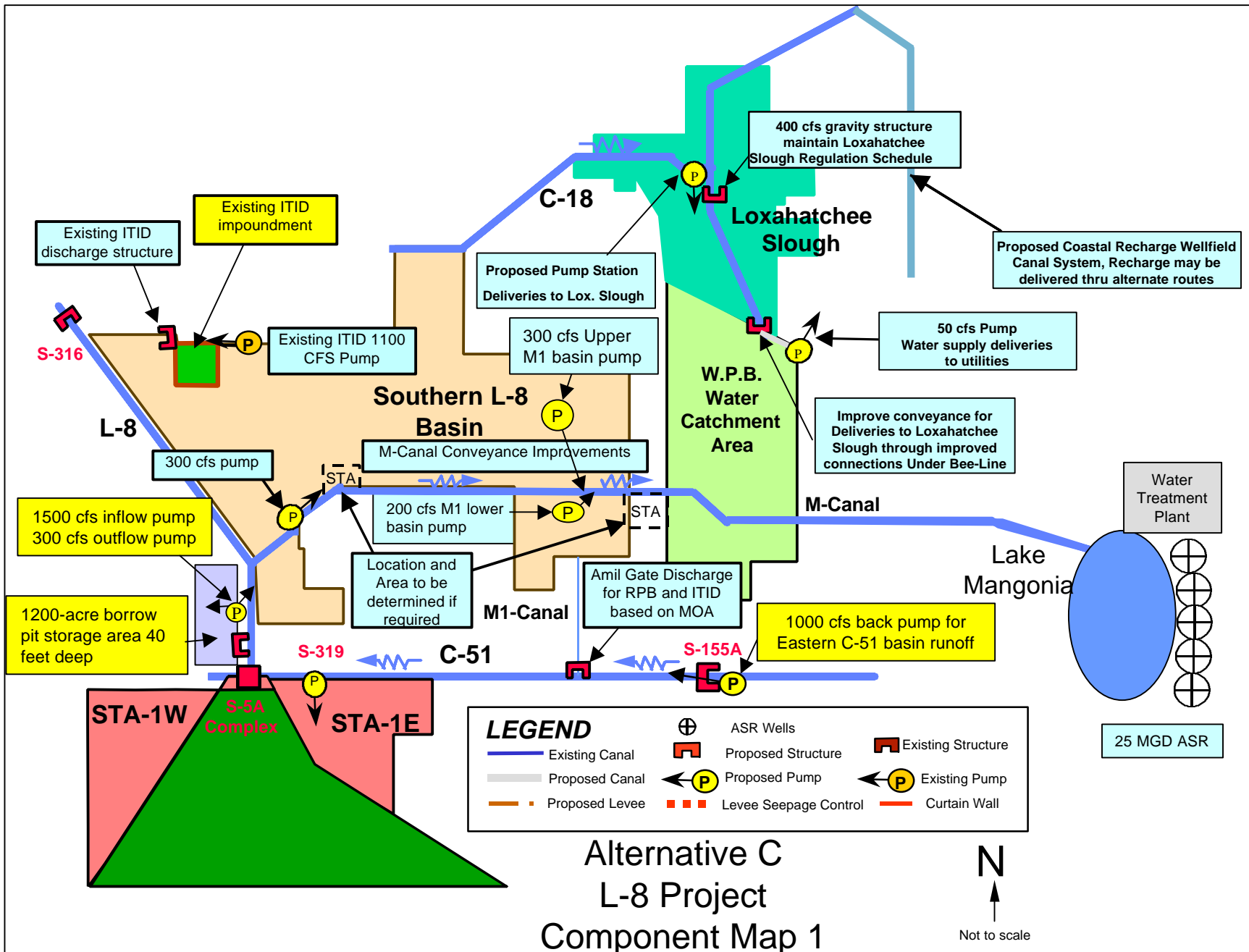
Assumptions and related considerations:

- 1) Should help maintain stages in the Loxahatchee Slough and reduce high discharges to the southwest fork of the Loxahatchee River.

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- 2) Stormwater Treatment Area upstream of the Water Catchment Area may be needed to accommodate future degradation of water quality.
- 3) Secondary structures (recharge canals) may be needed downstream of the Water Catchment Area to provide water to achieve the desired result.



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Component L3

Geographic Region: Lower East Coast Service Area

Component Title: Change coastal wellfield operations (same as Alternatives 3, 4 and 5)

Purpose: Shift demands from eastern wellfields to western facilities away from the saltwater interface to reduce impact of salt water intrusion.

Operation: For coastal utilities in the Lower East Coast Service Area which are experiencing an increased threat of saltwater intrusion, demands will be shifted from the eastern facilities to the western facilities away from the saltwater interface. The volume shifted is dependent upon the degree of saltwater intrusion but is generally proportional to the increase in demands between the 1995 existing conditions and the 2050 future without project conditions unless otherwise noted.

Design: For this alternative the following utilities have a portion of their demands shifted inland and include Riviera Beach, Lake Worth, Lantana, Manalapan, Boca Raton, Hollywood (including Broward County 3B and 3C), Dania, Miramar, Broward County 3A, Hallandale and Florida City. Redistribution of demands for Lake Worth, Lantana, Manalapan, Boca Raton and Florida City are generally consistent with the Lower East Coast Water Supply Plan. For the City of Riviera Beach, demands will be shifted from the eastern facilities to the western facilities with the western facilities absorbing the increased demand between the 1995 and 2050 conditions. For this alternative, the City of Miramar's eastern wellfield will be placed on standby and all demands will be met from the western wellfield. For the City of Hollywood, Hallandale, Dania, Broward County 3A, and Broward County 3B/3C all these wellfields will be placed on standby and the entire demand (with the exception of 4 MGD from the Floridan aquifer for Hollywood) will be met from the South Broward County Regional wellfield. Recharge to the Regional wellfield will be met through the existing canal system supplied from locally captured runoff from the C-9 Basin (Components R and S).

Location: Lower East Coast Service Area.

Counties: Broward, Miami-Dade and Palm Beach.

Assumptions and related considerations:

- 1) It is assumed that the western facilities of the individual utilities have sufficient capacity to meet the increased demands.

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Component M4

Geographic Region: Water Preserve Area - Palm Beach County

Component Title: Site 1 Impoundment (Modified from Alternative 3 to include additional Aquifer Storage and Recovery (ASR) wells) – SEE COMPONENT MAP 2

Purpose: Water supply storage reservoir to supplement water deliveries to the Hillsboro Canal during the dry-season.

Operation: The reservoir will be filled during the wet-season from excess water in Hillsboro Canal (backpumped). Water will be released back to Hillsboro Canal to help maintain canal stages during the dry-season. If water is not available in the reservoir, existing rules for water delivery to this region will be applied. Aquifer Storage and Recovery (ASR) is being incorporated to improve efficiency. Fifteen (15) 5 MGD capacity ASR wells will be added (total injection and recovery capacity 75 MGD). Water from the Site 1 Impoundment will be injected when stages in the impoundment are >14.0 feet NGVD (3 feet of depth in the impoundment). Water will be recovered from the ASR wells when stages in the Hillsboro Canal are <7.0 feet NGVD.

Design:

1660 acres with a maximum depth of 6 feet

Inflow pump capacity = 500 cfs

Outflow structure capacity = 200 cfs @ 4 feet head

Emergency outflow structure = 500 cfs

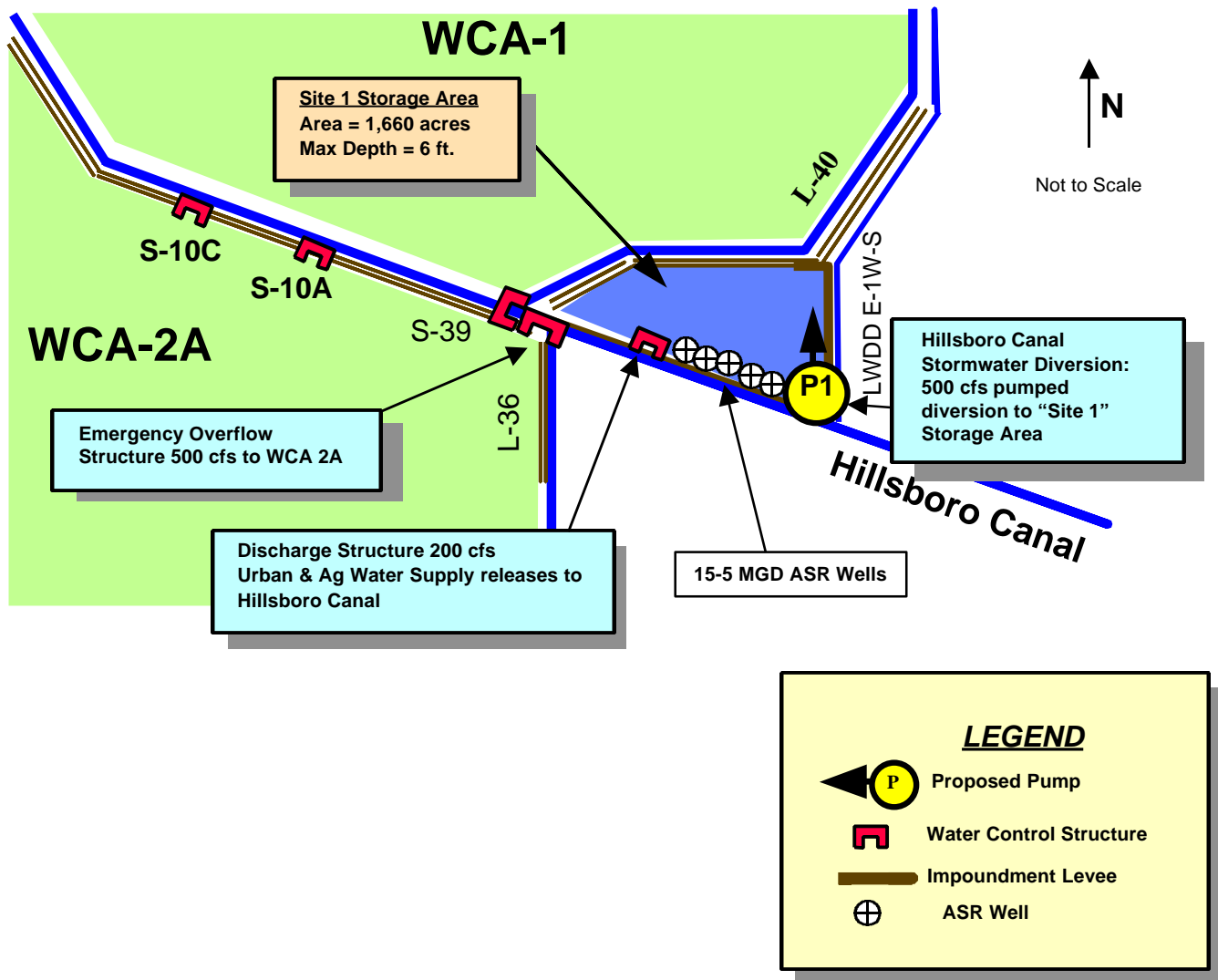
Fifteen (15) – 5 MGD ASR wells (total capacity 75 MGD)

Location: The Water Preserve Area Land Suitability Analysis previously identified 1660 acre site.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Excess storage could be discharged to Water Conservation Area 2A if a treatment facility could be added to meet Everglades' water quality standards.
- 2) Recovery rate of 70% efficiency for ASR wells is assumed.



**Alternative C**  
**Site 1 Impoundment**  
**Component Map 2**



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Component N2

(not included in this Alternative)

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Component O4

Geographic Region: Water Preserve Area - Broward County

Component Title: Water Conservation Area (WCA) 3A and 3B Levee Seepage Management (Similar to Alternatives 1, 2 and 3 except seepage from WCA 3 will be directed south to the Central Lake Belt storage area and will not be returned via the S-9 pump station) – SEE COMPONENT MAPS 3 and 4

Purpose: Reduce seepage from WCAs 3A and 3B to improve hydropatterns within the Conservation Areas by allowing higher water levels in the borrow canals and longer inundation durations within the marsh areas that are located east of the WCAs and west of US Highway 27. Seepage from the WCAs and marshes will be collected and directed south into the Central Lake Belt Storage Area. This will maintain flood protection and the separation of seepage water from urban runoff originating in the C-11 Basin and Lake Okeechobee water supply deliveries.

Operation: The L-37 and L-33 borrow canals will be held at higher stages as part of the WCA 2 seepage collection and conveyance system (Component YY). Seepage collected in the L-37 and L-33 borrow canals and from the marsh areas will be directed into the WCA 2 seepage collection and conveyance system and directed south into the Central Lake Belt Storage Area or directly to North East Shark River Slough.

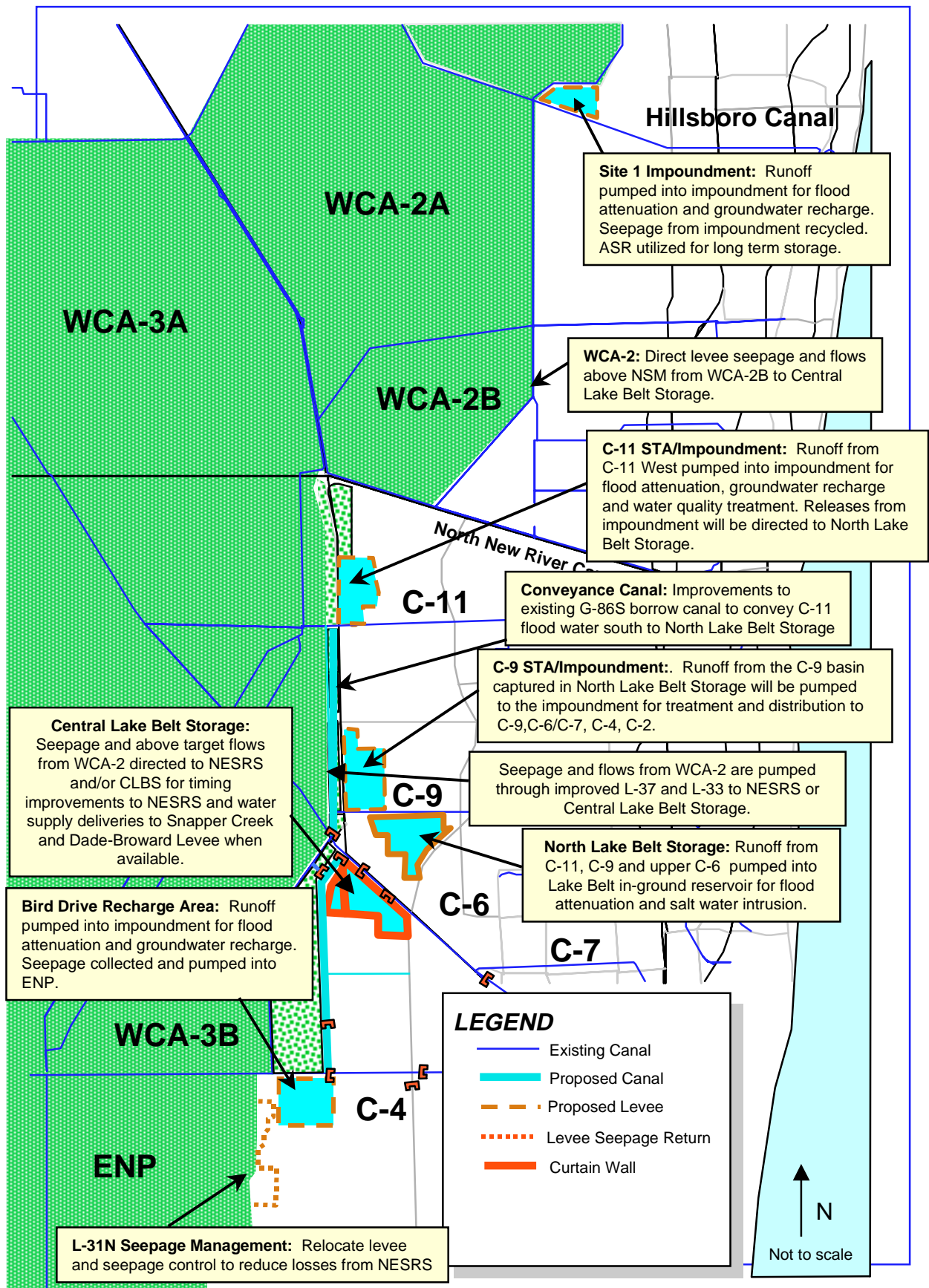
Design: New levees will be constructed west of US Highway 27 from the North New River Canal to the Miami (C-6) Canal to separate seepage water from the urban runoff in the C-11 diversion canal (Component Q). The L-37 and L-33 borrow canals will be controlled at higher stages as will the marshes located east of the WCAs. A divide structure will be added to the C-11 Canal west of US Highway 27 to maintain the separation of seepage water from urban runoff. Water from C-11 west will be diverted to the North Lake Belt Storage Area.

Location: Seepage collected in borrow canals along the existing eastern protective levees adjacent to WCA 3. Divide structure located in C-11 Canal east of US Highway 27.

Counties: Broward

Assumptions and related considerations:

(1) It is assumed that the seepage from the Water Conservation Areas meets the water quality standards necessary to achieve ecosystem restoration.



**General Water Preserve Area Components  
Alternative C  
Component Map 3**

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Component P2

(not included in this Alternative)

**-Draft-**  
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Component Q5

Geographic Region: Water Preserve Area - Broward County

Component Title: Western C-11 Diversion Impoundment and Canal -- to North Lake Belt Storage Area (NLBSA) (operational change in Alternative 5) - SEE COMPONENT MAPS 4 and 5

Purpose: Divert untreated runoff from western C-11 that is presently discharged into Water Conservation Area 3A through the C-11 Stormwater Treatment Area / Impoundment to the North Lake Belt Storage Area.

Operation: Runoff in the western C-11 Canal that was previously backpumped into Water Conservation Area 3A will be diverted to the C-11 STA/Impoundment and then to North Lake Belt Storage Area (NLBSA). If storage capacity is not available in the impoundment or NLBSA then the S-9 pump will be used for flood protection for the Western C-11 basin which pumps to WCA-3A. To improve groundwater elevations in the Eastern C-11 basin, the S-9 seepage divide structure will be operated to maintain the Western C-11 Canal stage at elevation 3.0 feet NGVD.

Design:

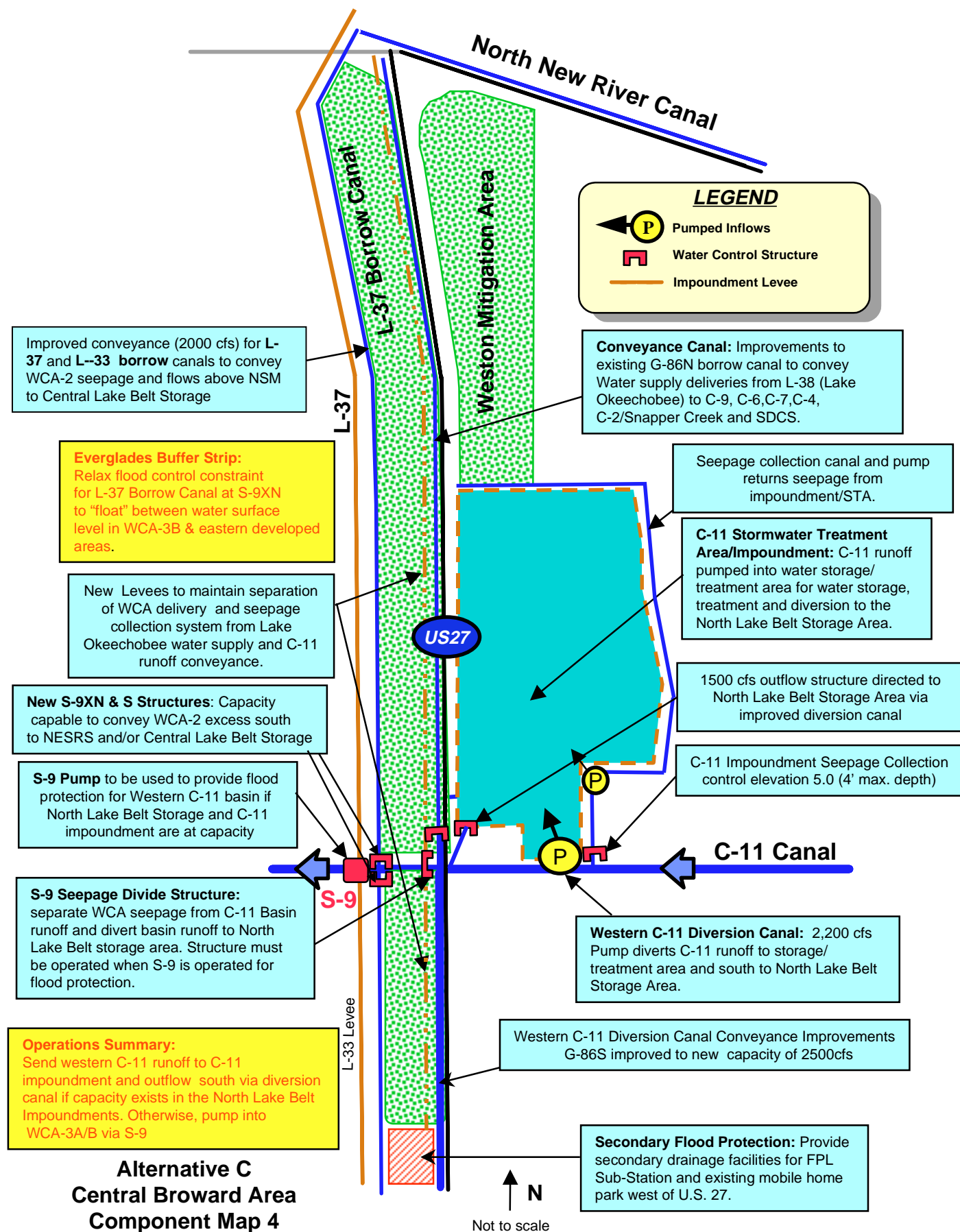
- (1) 2500 cfs diversion canal west of U.S. 27 between C-11 and C-9 and a 2500 cfs conveyance capacity improvements to the C-9 canal between S-30 and the NLBSA.
- (2) Intermediate 2500 cfs pump station in the C-11 Canal to direct runoff to the C11 STA/Impoundment.
- (3) 1600 acre STA/Impoundment
- (4) Seepage Collection canal and Pump for C-11 STA/impoundment.
- (5) 2500 cfs structure to discharge from the impoundment to C-11 west of US 27 to diversion canal.

Location: The diversion canal is located west of US-27 between C-11 and C-9 Canals. The C-11 STA/Impoundment is located northwest of the intersection of US27 and C-11 Canal.

Counties: Broward, Miami-Dade

Assumptions and related considerations:

- 1) Flood protection component for FPL substation and mobile home park may be needed.
- 2) Telemetry systems will be required for all operable structures and pump stations.



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Component R4

Geographic Region: Water Preserve Area - Broward County

Component Title: C-9 Stormwater Treatment Area/Impoundment (modified from Alternatives 1 and 2. Discharges made from North Lake Belt Storage Area are directed through C-9 STA/Impoundment for water supply deliveries to C-9, C-6/C-7, C-2/C-4) SEE COMPONENT MAP 5

Purpose: Treatment of water supply deliveries from North Lake Belt Storage Area (NLBSA) to C-9, C-6/C-7 and C-2/C-4 Canals. NLBSA is used to capture runoff from western C-9 basin and C-11 west by backpumping into the curtain walled reservoir area. The C-9 STA/Impoundment will provide treatment of runoff stored in North Lake Belt Storage Area, groundwater recharge within the basin and seepage control of WCA3 and buffer areas to the west.

Operation: Water supply deliveries from North Lake Belt Storage Area to C-9, C-6/C-7 and C-2/C-4 Canals will be pumped into the C-9 STA/Impoundment for treatment of the stormwater runoff stored in the NLBSA. Seepage from C-9 impoundment will be collected and returned to the impoundment.

Design:

2500 acres with a maximum depth of 4 feet

Inflow structure: 1500 cfs pump (NLBSA) (to be resized as needed) SEE COMPONENT XX

Outflow structure: Gravity structure with 1500 cfs capacity at 4 feet of head. Discharge C-9 impoundment to C-9, C-6/C-7 and C-2/C-4 Canals for water supply deliveries.

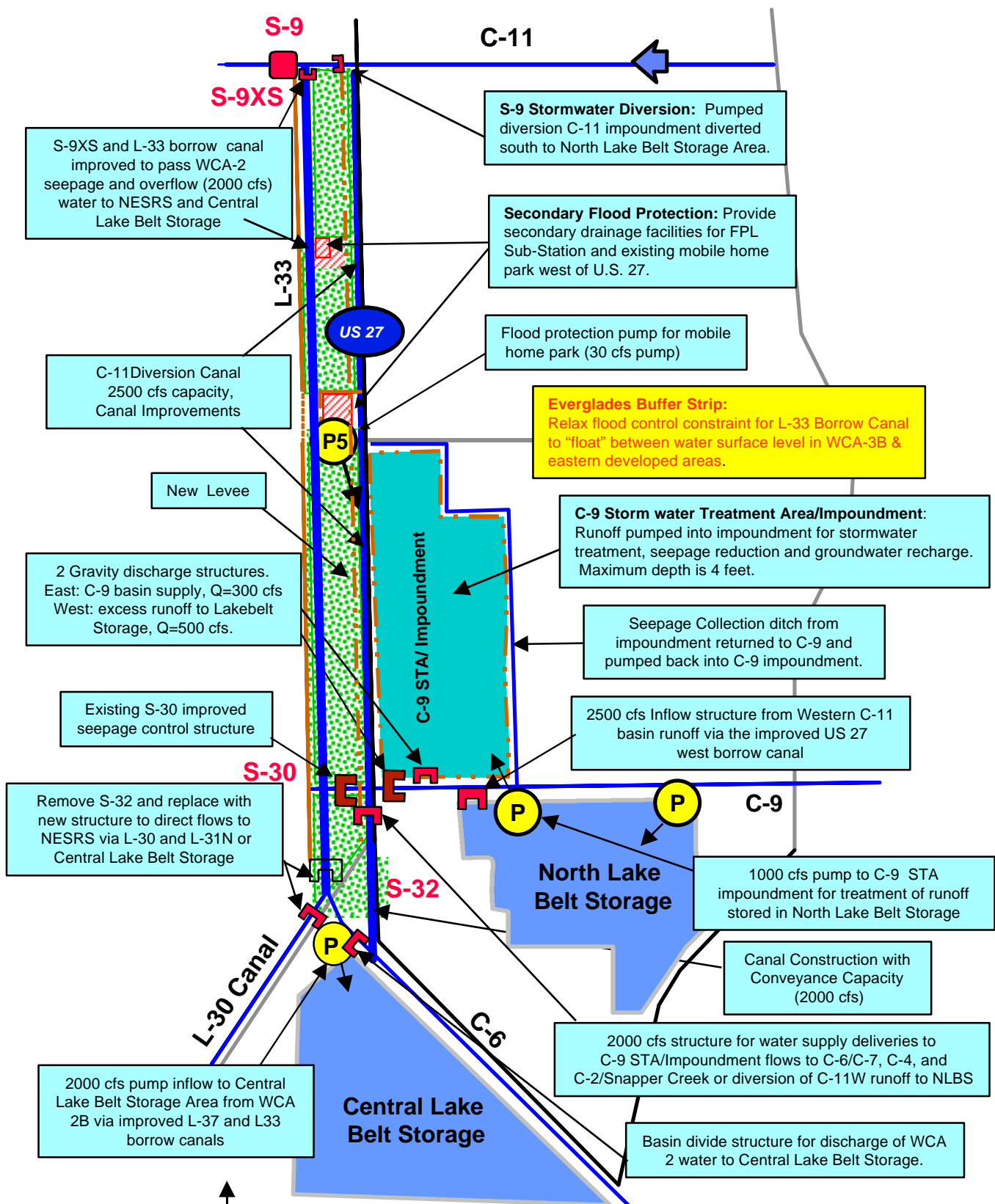
Seepage Collection: 200 cfs recycled into the impoundment area

Location: Site identified by Water Preserve Area Land Suitability Analysis  
Counties: Broward

Assumptions and related considerations:

- 1) Additional treatment facility needed if stored water is backpumped into Water Conservation Area 3A.
- 2) Telemetry systems will be required for all operable structures and pump stations.





**Alternative C**  
**S.W. Broward Area**  
**Component Map 5**



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Component S5

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: Central Lake Belt Storage Area (CLBSA) - SEE COMPONENT MAP 6

Purpose: In-ground reservoir to receive excess water from Water Conservation Areas (WCA) 2B, 3A and 3B. The in-ground reservoir, CLBSA, with perimeter seepage barrier will allow storage of large quantities of water without groundwater seepage losses in this highly transmissive region. The water stored in CLBSA will be provided to 1) Northeast Shark River Slough (NESRS), 2) Water Conservation Area 3B, 3) to supply flows to Biscayne Bay and 4) when available to meet Snapper Creek demands and to maintain Dade-Broward levee at 5.0 feet NGVD.

Operation: Inflows from L-33 (see Component XX) is through a 1,500 cfs pump. Inflow ceases when stages reach ~11.0 feet, NGVD (6 feet above adjacent land elevation). Inflows from L-33 diverted to CLBSA.

Outflows for water deliveries are pumped through a polishing marsh cell prior delivery to NESRS via L-30 and a reconfigured L-31 N (see component U). Deliveries of water to NESRS to maintain 6 inch depths will occur when NESRS dries below 6 inches above ground, and target hydroperiods simulations call for NESRS to be inundated. Also in this alternative, CLBSA delivers water to WCA 3B via L-30 to inundate the eastern area of WCA 3B to a 6 inch depth. This delivery occurs when WCA 3B dries below 6 inches above ground, and target hydroperiods simulations call for WCA 3B to be inundated. When available, outflows will be directed to Biscayne Bay then Snapper Creek at the Turnpike (See Component Map 6) and lastly to the Dade-Broward Levee through a polishing marsh prior to discharge to the canal.

Supply from the reservoir can be withdrawn for stages down to -15 feet NGVD (up to 26 feet of working storage & maximum head on seepage barrier).

Design:

Reservoir: 5200 acres with subterranean seepage barrier around the perimeter to enable drawdown during dry periods and to prevent seepage losses.

Inflow Structures: 1500 cfs pump from the L-33 borrow canal  
500 cfs structure at S-9 pump station to gravity discharge  
from WCA 3A to L-33

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700 cfs structure (Existing S-31) for WCA 3B to CLBSA via  
C-6 Canal

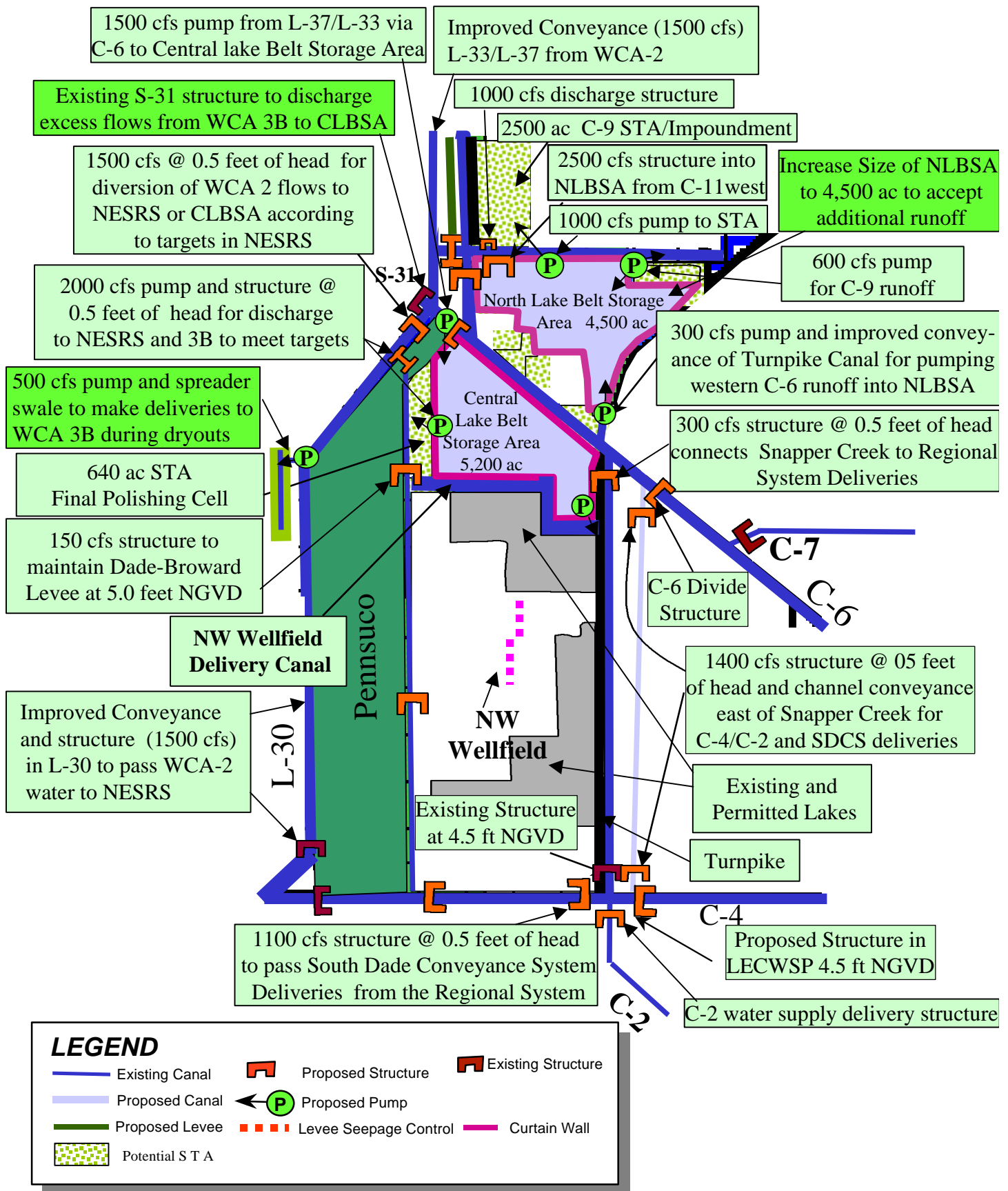
Outflow Structures: 800 cfs pump to polishing cell to make deliveries to NESRS  
and WCA 3B  
500 cfs pump off L-30 to deliver to WCA 3B  
150 cfs gravity structure to Dade-Broward Levee.  
300 cfs pump to make deliveries for Snapper Creek Canal  
1100 cfs structure @0.5 feet of head to provide regional  
system deliveries to Snapper Creek canal via C-6 if CLBS is  
out of water  
640 acre STA (polishing cell).

Location: Reservoir would be located within the area proposed for rock  
mining by the Lake Belt Issue Team. It would be sited south of Miami Canal  
(C-6) and north of the Northwest Wellfield Delivery canal to minimize impacts to  
the Northwest wellfield.

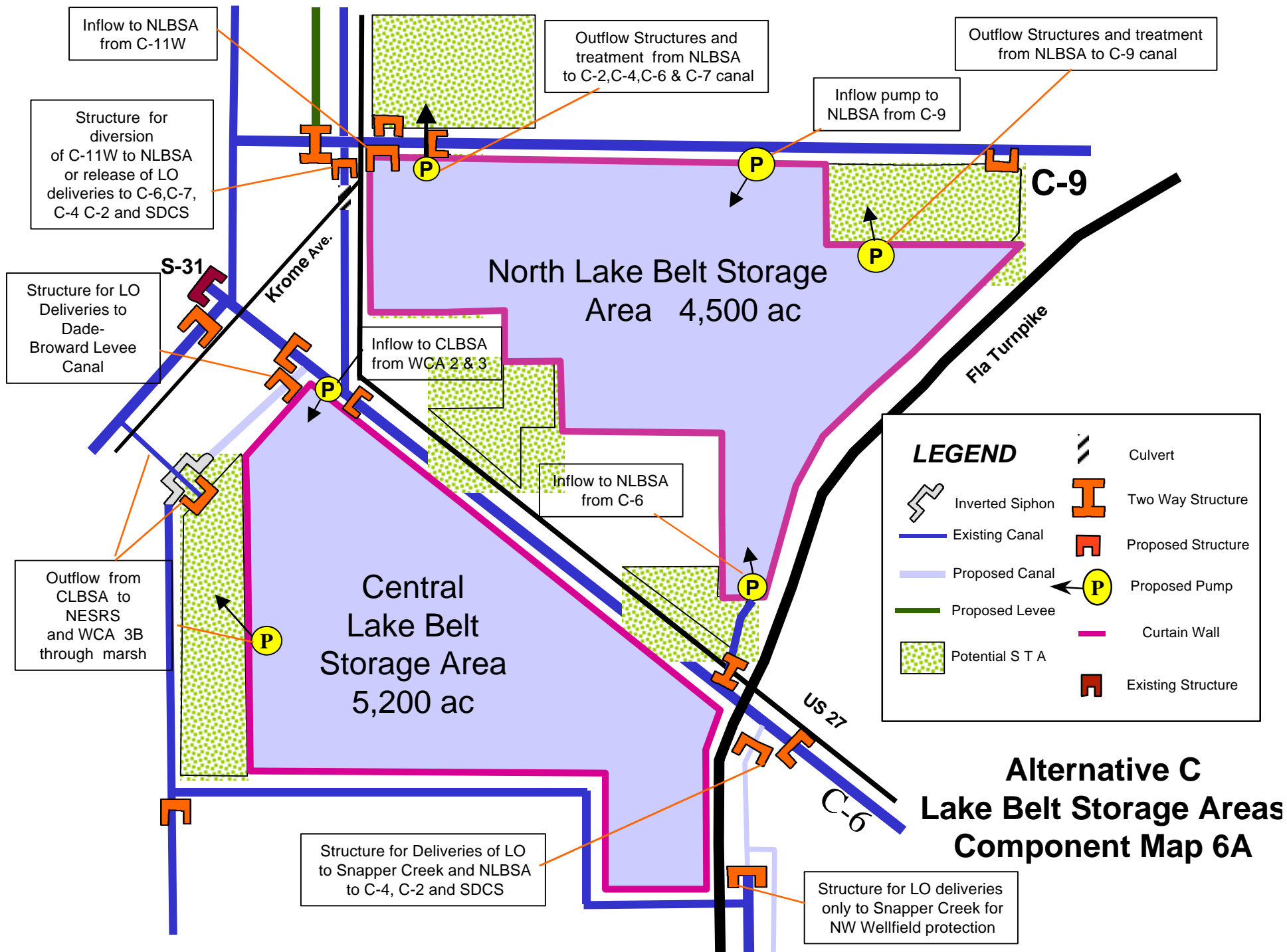
Counties: Miami-Dade

Assumptions and related considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's NW  
wellfield
- 2) Treatment facility needed if stored water is backpumped to the Everglades.
- 3) All water quality considerations will be addressed regarding releases from the  
reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on  
wetland mitigation around the wellfield.
- 5) Limestone Filter Treatment system within the Reservoir may be developed  
through use of compartmentalization of rockmining excavation pattern.
- 6) Telemetry systems will be required for all operable structures and pump  
stations.



**Alternative C**  
**North and Central Lake Belt Storage Areas**  
**Component Map 6**



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Component T6

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: C-4 Structures (Similar to Alternatives 1, 2, 3, 4 and 5 except that an additional C-4 structure was included to be consistent with the 2050 Base).

Purpose: Proposed structures (East and West) would provide two separate benefits. The West structure would control water levels in the C-4 Canal at higher elevation to reduce seepage losses from the Pennsuco Wetlands and areas to the west of the structure and the East structure would reduce regional system deliveries by diverting dry season stormwater flows to the C-2 Canal to increase recharge nearby several coastal wellfields.

Operation: The West structure would maintain water levels at 6.5 feet NGVD for seepage control purposes and be capable of passing flood flows with a minimum of head loss and supplying water to the C-4 basin to meet demands. The East structure would divert dry season stormwater flows from the western C-4 basin to the C-2 Canal to recharge the wellfields in the eastern C-2 basin.

Design: East Structure- Operable lift-gate with 6.5 feet NGVD overflow and approximately 400 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: Just downstream of the Dade-Broward Levee in C-4 Canal.

West Structure- Operable lift-gate with 4.5 feet NGVD overflow and approximately 600 cfs capacity (final design specifications will be determined in detailed design and hydrologic and hydraulic modeling in the future).

Location: In C-4, just downstream of the confluence of the C-2 and C-4 Canals.

Assumptions and related considerations:

- 1) Benefits to WCA-3B associated with improved C-4 seepage control are directly related to the proposed G-356 pumpage (Modified Water Deliveries).
- 2) Head losses across the proposed structures will not inhibit passing flood releases when necessary.
- 3) A pump may be associated with the West structure if back pumping the C-4 basin runoff to the Bird Drive Recharge Area becomes a component of the final alternative.

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Component U4

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: Bird Drive Recharge Area (Modified from Alternative 3 for enhanced seepage collection) -- SEE COMPONENT MAP 7

Purpose: Capture runoff from western C-4 basin through pumping to Bird Drive recharge area to reduce seepage from the Everglades National Park (ENP) buffer areas by increasing water table elevations east of Krome Ave. The facility will provide C-4 flood peak attenuation and enhance groundwater recharge within the basin.

Operation: Inflows from western C-4 basin will be pumped into proposed Recharge Area to provide flood peak attenuation, groundwater recharge and reduce seepage from ENP buffer areas by increasing water table elevations east of the buffer areas. C-4 runoff in excess of 200 cfs pump capacity will be discharged eastward. Outflows will be used to meet C-4 needs when available. The modification of this component is routing of regional system deliveries (through the seepage collection canal system) of the Bird Drive Recharge Area to the South Dade Conveyance System (SDCS). This should reduce seepage from areas west of Krome Ave.

Design:

2877 acres with a maximum depth of 4 feet

Inflow structure: 200 cfs pump (to be resized as needed)

Outflow structure:

Water supply: Gravity structure with 200 cfs capacity at 2 feet of head.

Seepage Collection System: 500 cfs pump to control seepage collection canal at 5.0 feet NGVD. Pump to L-31N.

Delivery System: 800 cfs pump to provide regional system deliveries to SDCS

800 cfs canal capacity increased in the Bird Drive seepage collection canals to pass the regional system deliveries to the South Dade Conveyance System.

5 miles of canal with 800 cfs capacity between Bird Drive seepage collection system to C-1W just east of Krome Ave.

Relocate S-338 east of Krome Ave. and delivery canal.

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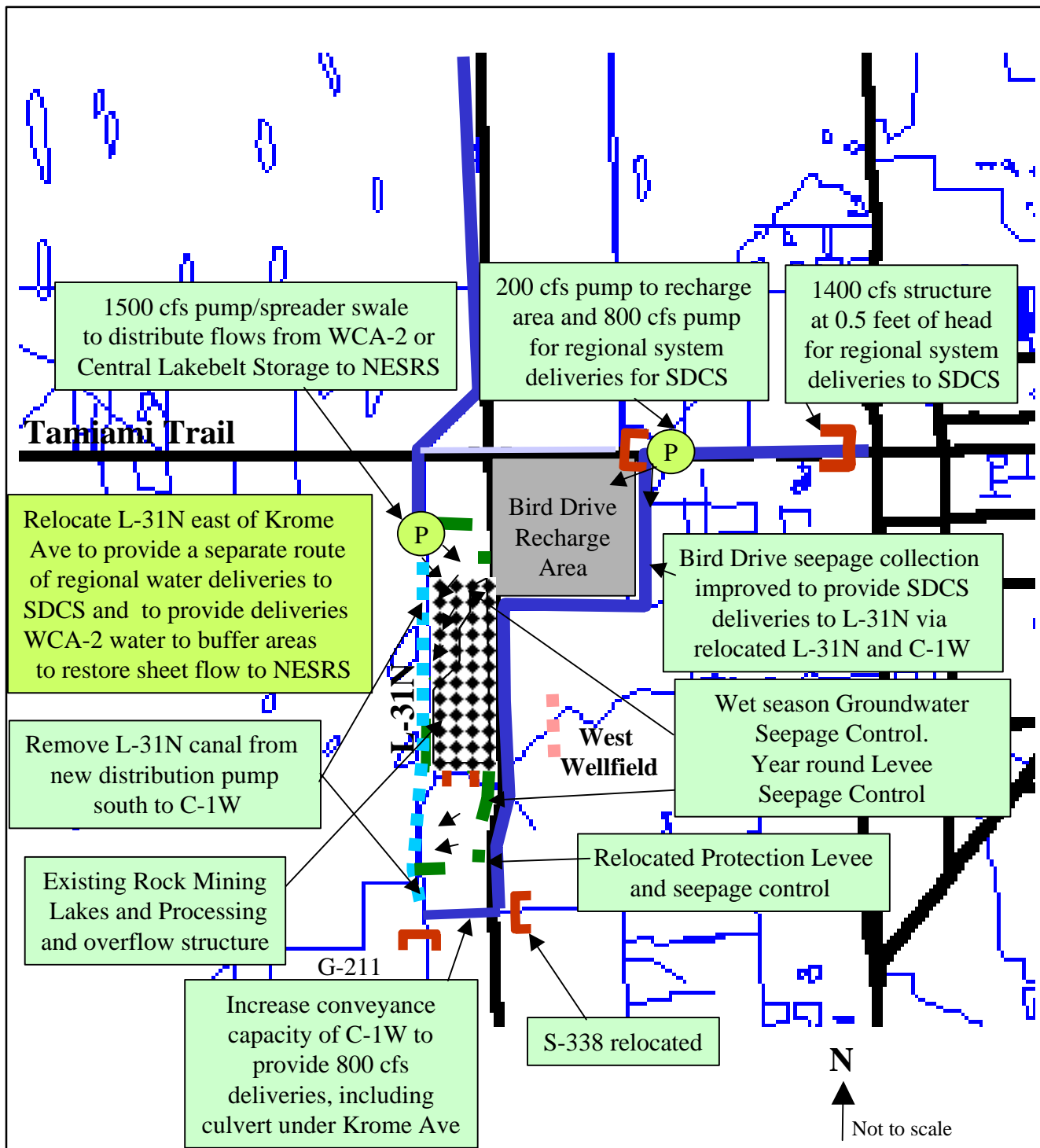
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Location: Northwestern 4 sections in Bird Drive basin. This site was identified during the Water Preserve Area Land Suitability Analysis.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) Treatment facility needed if seepage collected does not meet Everglades standards.
- 2) Telemetry systems will be required for all operable structures and pump stations.



**Alternative C  
Bird Drive Basin  
Component Map 7**



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Component V4

Geographic Region: Water Preserve Area – Miami-Dade County

Component Title: L-31N Levee Improvements for Seepage Management (Same as Alternatives 4 and 5) – SEE COMPONENT MAP 7

Purpose: Levee seepage management along the eastern edge (L-31N) of Everglades National Park to eliminate losses due to levee seepage to the East Coast. An additional feature has been added to reduce all wet-season seepage/ground water flows to the east. Feature will help restore hydro patterns in Everglades National Park.

Operation: 100% reduction in levee seepage flow from Everglades National Park year-round (to be achieved via Component FF4). Further 100% reduction in all groundwater flows during the wet-season. Bird Drive Recharge Area and North Lake Belt Storage Area will be used to recharge aquifers to the east.

Design:

Levee Seepage: Refer to Component FF4.

Wet-Season Ground Water Seepage: Distributed ground water wells adjacent to L-31N and return flows to Everglades National Park.

If needed, aquifer recharge will occur from deliveries from Bird Drive Recharge Area and North Lake Belt Storage Area.

Location: Along the existing eastern protective levee (L-31N) adjacent to Everglades National Park.

Counties: Miami-Dade

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Component W2

Geographic Region: Taylor Creek/Nubbin Slough

Component Title: Taylor Creek/Nubbin Slough Storage and Treatment Area  
(same as Alternatives 2, 3, 4 and 5)

Purpose: Storage reservoir to provide flood protection, water quality treatment, estuary protection and water supply benefits.

Operation: Local runoff from the Taylor Creek/Nubbin Slough basins to be pumped into a 5000-acre reservoir and then into a 5000-acre stormwater treatment area. The stormwater treatment area will reduce phosphorus concentrations in the runoff from approximately 0.528 mg/l to 0.107 mg/l. Treated water will then be pumped into Lake Okeechobee when the lake stage is falling and is at least 0.5 feet below the bottom pulse release zone.

Design:

Storage Reservoir:

5000-acres at 10 feet maximum depth.

Inflow pump capacity 2500 cfs.

Outflow pump capacity 1000 cfs.

Stormwater Treatment Area:

5000-acres at 4 feet maximum depth.

Inflow pump capacity 1000 cfs (same structure as reservoir outflow).

Outflow pump capacity 1000 cfs.

Location: North of Lake Okeechobee  
Counties: Okeechobee, St. Lucie

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential increase in stage duration of Lake Okeechobee.
- 3) Potential decrease in maximum stages of Lake Okeechobee.
- 4) Phosphorus inflow concentrations (flow-weighted) for the Taylor Creek (S-191) and Nubbin Slough (S-133) Basins obtained from 5-year rolling averages (1991-1995).
- 5) Average annual discharge rates determined from the period of record 1965-1990.

**-Draft-**  
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Component X6

Geographic Region: Water Preserve Area – Palm Beach County

Component Title: C-17 Backpumping (similar to Alternative 3 with delivery route and operational changes) – SEE COMPONENT MAP 8

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-17 Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in the Loxahatchee Slough.

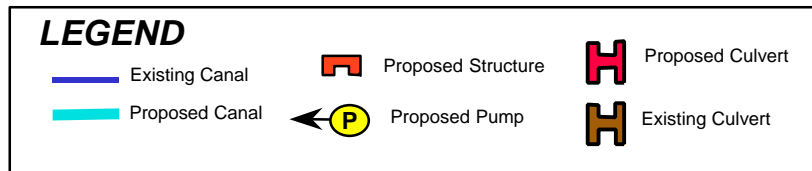
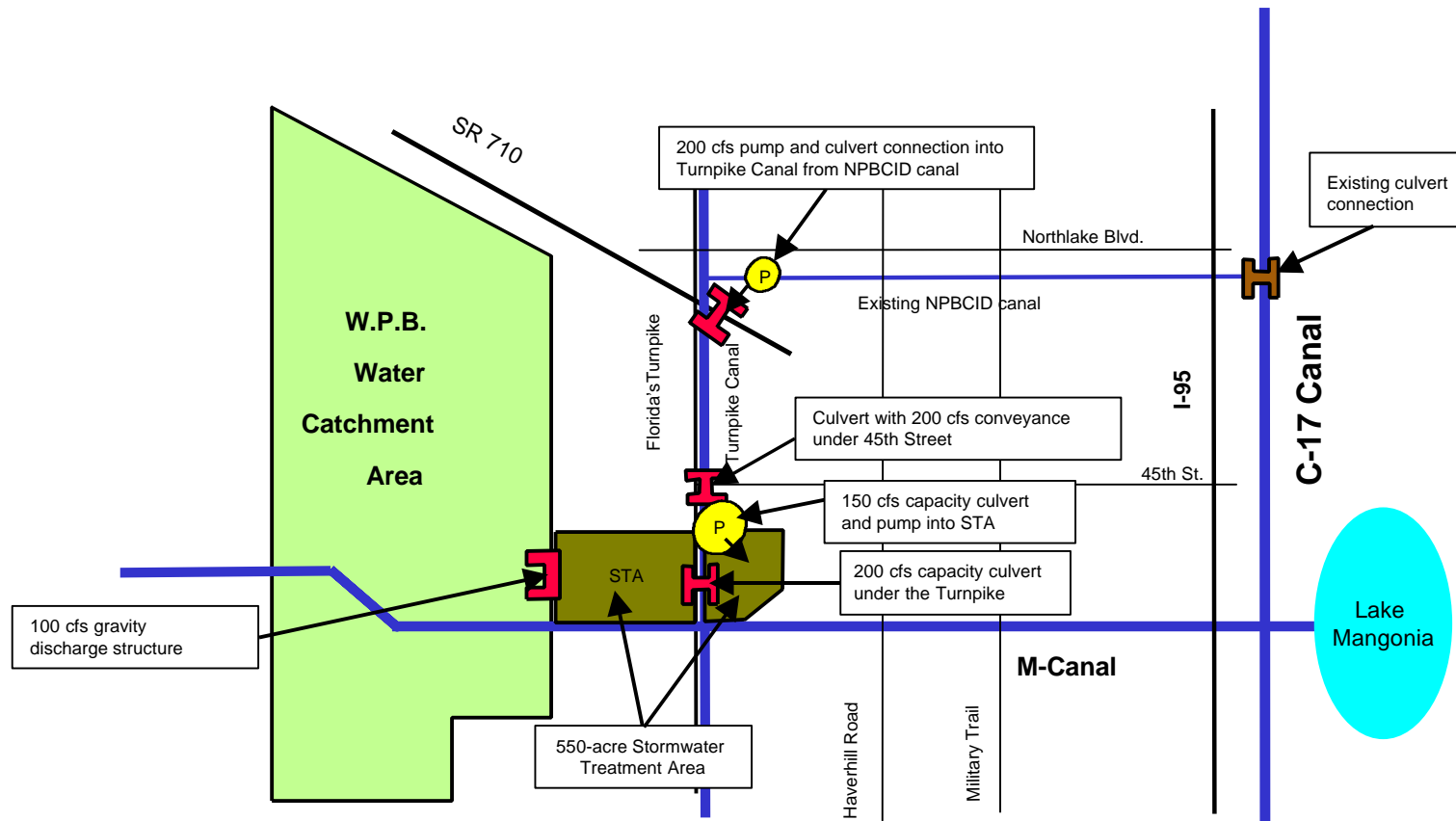
Operation: Capture excess C-17 Canal water to meet urban water supply demands in North Palm Beach Service Area. Water would be diverted through existing canals to a stormwater treatment area and ultimately to the West Palm Beach Water Catchment Area.

Design: 200 cfs pump in the existing Northern Palm Beach County Improvement District canal at its intersection with the Turnpike Canal to pull flows west and direct them south into the east Turnpike Canal.  
Culvert under 45<sup>th</sup> Street (N/S) to connect the east Turnpike Canal.  
150 cfs capacity culvert and pump from the Turnpike Canal to direct flows into the proposed stormwater treatment area.  
550 acre stormwater treatment area at 4 feet maximum depth.  
200 cfs Culvert to connect stormwater treatment area under Florida's Turnpike to allow nonrestrictive flows.  
100 cfs gravity discharge structure into West Palm Beach Water Catchment Area.

Location: 550 acres located east of the West Palm Beach Water Catchment Area.  
Counties: Palm Beach

Assumptions and related considerations:

- 1) Water quality of C-17 water similar to C-51 water quality.
- 2) Location of stormwater treatment area south of existing landfill.
- 3) Improve conveyance in the Northern Palm Beach County Improvement District and Turnpike canals as necessary to pass flows.



N  
↑  
Not to scale

Alternative C  
C-17  
Component Map 8

**-Draft-**  
*C&SF Comprehensive Review Study – Alternative C*

Component Y6

Geographic Region: Water Catchment Area – Palm Beach County

Component Title: C-51 Backpumping to Water Catchment Area (similar to Alternative 3 with operational changes) – SEE COMPONENT MAP 9

Purpose: Reduce water supply restrictions in Northern Palm Beach County Service Area by providing additional flows from the C-51 West Basin to the West Palm Beach Water Catchment Area and enhance hydroperiods in Loxahatchee Slough.

Operation: Capture excess C-51 Canal water to meet urban water supply demands in the North Palm Beach County Service Area. Water would be diverted from C-51 to a water treatment area and then into the Water Catchment Area.

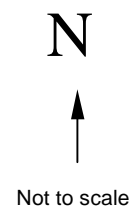
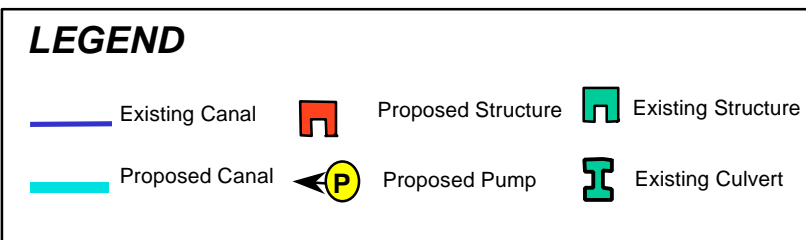
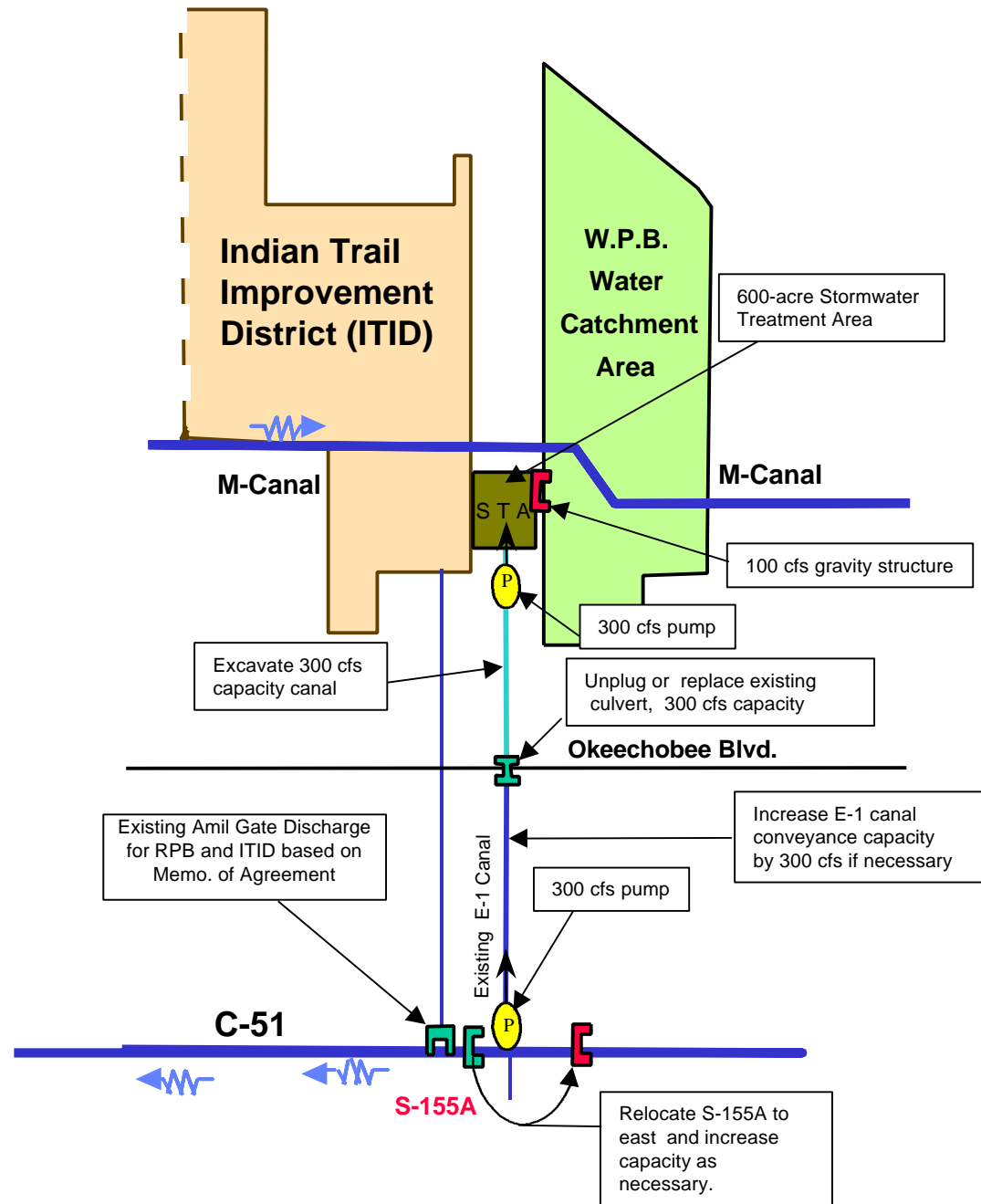
Design: 600 acres at 4 feet maximum depth to be used for stormwater treatment. Relocate the S-155A structure east of the intersection of Lake Worth Drainage District's E-1 Canal and the C-51 Canal and increase the capacity of S-155A from 1000 cfs to 1300 cfs. Improve conveyance between C-51 and the stormwater treatment area as necessary. 300 cfs inflow pump to stormwater treatment area. 100 cfs gravity discharge structure into West Palm Beach Water Catchment Area.

Location: 600 acres located southwest of West Palm Beach Water Catchment Area.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Connection of L-8 and C-51 Basins.



Alternative C  
C-51 East  
Component Map 9

**-Draft-**  
*C&SF Comprehensive Review Study – Alternative C*

Component AA3

Geographic Region: Central and Southern Everglades, Water Conservation Areas and Everglades National Park

Component Title: Additional S-345 structures (same as Alternatives 3, 4 and 5).

Purpose: The compartmentalization of the Water Conservation Areas (WCA) has contributed to the loss of historic overland flows of the central Everglades slough system. This alteration of flows has resulted in temporal changes in hydropatterns and hydroperiods in the historic deepwater, central axis of the Shark Slough system. This component adds conveyance to WCA 3B to help in re-establishing NSM-like hydroperiods and hydropatterns in WCA 3B and Northeast Shark River Slough.

Operation: The addition of a North East Shark River Slough rainfall trigger well and modification of western Shark Slough basin rainfall triggers deliver additional flows to the basin. Modification of L-67A decreases downstream conveyance to the S-12's required to promote surface water flows to Water Conservation Area 3B and to North East Shark River Slough.

Design: Triple the total discharge capacity of S-345's to 4500 cfs and the addition of associated plugs (S-349's).

Location: The additional structures and plugs are to be spaced evenly along the southern half of L-67A.

Assumptions and related concerns:

- 1) The emphasis is in re-establishing the historic persistent, deep-water slough that existed in Water Conservation Area 3B and North East Shark River Slough.

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*C&SF Comprehensive Review Study – Alternative C*

Component BB5

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: Dade Broward Levee / Pennsuco Wetlands (same as Alternative 5) -- SEE COMPONENT MAP 6

Purpose: Reduce seepage to the east from the Pennsuco wetlands and southern Water Conservation Area (WCA) 3B and enhance hydroperiods in the Pennsuco. Also an improved Dade Broward Levee will enhance recharge to Miami-Dade County's Northwest Wellfield.

Operation: Improvements to the Dade-Broward Levee and associated conveyance system will reduce seepage losses to the east and provide recharge to Miami-Dade County's Northwest Wellfield. Seepage reduction will enhance hydroperiods in Pennsuco wetlands and hold stage higher along southeastern WCA 3B. Recharging the conveyance features of the Dade-Broward levee from the regional system deliveries provides recharge to Miami-Dade County's Northwest Wellfield. Treatment areas will be provided to meet all water quality standards required, if necessary.

Design:

Improve the Dade-Broward Levee:

Construct or improve existing levee to five-foot height with 2-foot top width while creating or improving existing conveyance to a capacity of up to 300 cfs.

150 cfs bypass structure and canal from C-6 Canal to Dade-Broward Levee to provide recharge from the regional system via the improved US Highway #27 borrow canal.

150 cfs gravity structure in the Dade-Broward Levee Borrow Channels due west of the southern end of the Northwest Wellfield to provide recharge for the Dade-Broward levee when the Conveyance Channel is below 5.0 feet NGVD at the C-4 structure located at the southern end of the Dade-Broward Levee.

Location: Dade-Broward Levee, Pennsuco Wetlands, WCA-3B, the Central Lake Belt Storage Area and Miami-Dade County's Northwest Wellfield.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) Wellfield protection must be maintain through recharge of acceptable water quality.
- 2) Secondary structures within the recharge canals may be needed to provide seepage reduction and wellfield recharge desired.



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*C&SF Comprehensive Review Study – Alternative C*

- 3) The stage maintained in the Dade-Broward Levee conveyance is subject to change.

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Component CC6

Geographical Region: Lower East Coast

Component Title: Broward County Secondary Canal System (modified from Alternative 5 to include improvements in the C-10 and C-12 basins) - SEE COMPONENT MAP 10

Purpose: Increase pump capacity of existing facilities (from the 2050 Base Case) and construct additional canal and pump facilities for the Broward Secondary Canal System to provide recharge to wellfields located in central and southern coastal Broward County, stabilize the salt water interface and reduce storm water discharges to tide.

Operation: When excess water is available in the basin, water is pumped into the coastal canal systems to maintain canal stages. When local water is not sufficient to maintain canal stages, canals are maintained first from local sources and then from Lake Okeechobee and the Water Conservation Areas. Local sources include the Site 1 Impoundment (Component M), the Hillsboro Canal Aquifer Storage and Recovery (Component NN), and the North Lake Belt Storage Area (Component XX).

Secondary canals maintained are 1) Broward County's C-2 from the Hillsboro Canal, 2) north secondary canal from C-13, 3) south secondary canal from C-13, 4) Turnpike canal south from C-12 (from Alternative 4) and 5) canal north from C-9 (added in Alternative 5) at levels discussed below.

Design:

Canal Conveyance: Improve canal conveyance of secondary canal located east of the Florida Turnpike from the C-12 Canal south to the Fort Lauderdale Golf and Country Club. Alternative 5 includes routing of water eastward to recharge the aquifer and help stabilize the saltwater interface at Feet Lauderdale. Canal conveyance improvements may also be necessary for the Old Plantation Water Control District's eastern canal and in southeastern Broward County.

Pump capacities and maintenance levels:

- 100 cfs pump from Hillsboro to Broward County Secondary Canal (pump #1)
- 100 cfs pump from C-13 north to Broward County Secondary Canal
- 100 cfs pump from C-13 south to Broward County Secondary Canal (pumps #2 and #3 described in the 2050 Base Case increased from 33 cfs to 100 cfs (as proposed in Alternatives 4 and 5).
- 100 cfs pump on the east Turnpike canal withdrawing water from the C-12 Canal (pump #4 as proposed in Alternative 4).
- 150 cfs pump (pump #5 proposed in Alternative 5) on the C-9 Canal for maintaining water in southeastern Broward County.

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*C&SF Comprehensive Review Study - Alternative C*

Canal improvements and control elevations:

Improve east and west Turnpike canals and golf course lake system between C-12 and the North New River to achieve a average top width of 200 feet (Modified in Alternative 6) (see Map 10).

The Turnpike canals shall be maintained at a minimum elevation of 4.0 feet NGVD (Modified in Alternative 6).

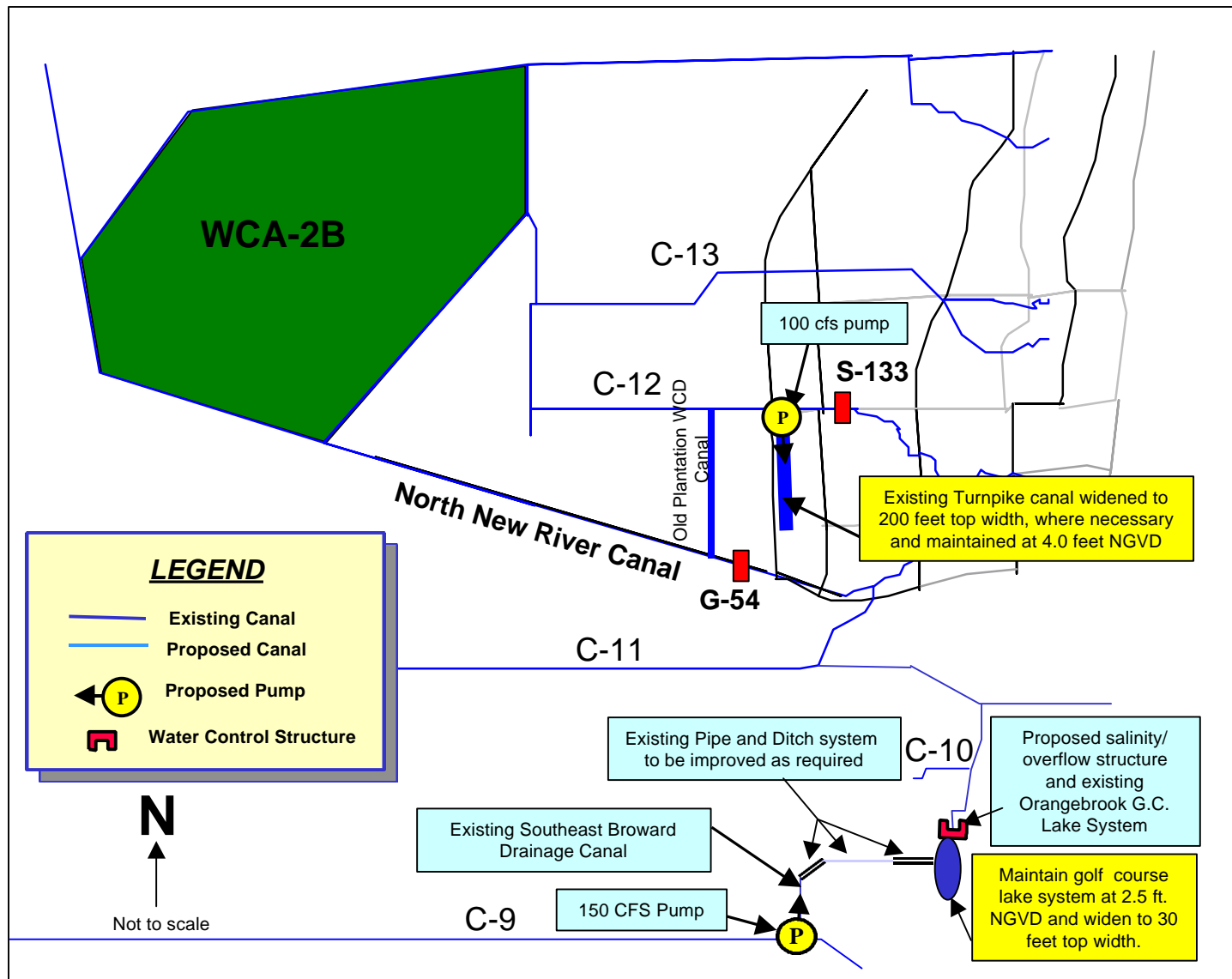
Improve canal/ lake systems in southeastern Broward County and the Orangebrook Golf Course to have an average canal top width of 30 feet (Modified in Alternative 6).

The southeastern Broward Canal system shall be maintained at a minimum elevation of 2.5 feet NGVD (Modified in Alternative 6).

Location: Broward County

Assumptions and related considerations:

- 1) Canal levels are maintained from local basin runoff and sources. When water in not available from local sources, water is supplied to the canal systems from the regional system.
- 2) Canal operations do not impact existing flood control levels.



Alternative C  
Broward County Secondary Canal System  
Component Map 10

**-Draft-**  
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Component DD5

Geographic Region: Holey Land Wildlife Management Area

Component Title: Modified Holey Land Operation Plan (same as Alternative 5)

Purpose: Improve timing and location of water depths within the Holey Land Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven modified operational rules with NSM-like hydrologic conditions triggering deliveries. Rainfall-driven inflows are driven by target water depths in cell R45C18. Outflows are based on target water depths in R42C20. Alternative 5 truncates the peaks 1.5 feet above ground level and the troughs 1.0 foot below ground level.

Design: Operational change only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Water deliveries made to the Holey Land through G-200A or from Stormwater Treatment Area 3 & 4 if Rotenberger flows are insufficient. The deliveries are assumed to be of acceptable water quality from either Rotenberger or Lake Okeechobee through Stormwater Treatment Area 3 & 4.

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Component EE5

Geographic Region: Rotenberger

Component Title: Modified Rotenberger Operation Plan (same as Alternative 5)

Purpose: Improve timing and location of water depths within the Rotenberger Wildlife Management Area based on rain-driven operations.

Operation: Rainfall-driven operational rules with NSM-like hydrologic conditions triggering deliveries. Rainfall-driven inflows and outflows are driven by the average of target water depths in cells R46C15 and R43C16. Alternative 5 truncates the peaks 1.5 feet above ground level and the troughs 1.0 foot below ground level.

Design: Operational change only.

Location: Southern portion of the Everglades Agricultural Area, north of Water Conservation Area 3A.

Counties: Palm Beach

Assumptions and related considerations:

- 1) Water deliveries made to Rotenberger from Stormwater Treatment Area 5 are assumed to be of acceptable water quality.

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Component FF4

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: Construction of S-356 A & B Structures (modified from Alternative 3 to include relocation of a portion of L-31N) – SEE COMPONENT MAP 7

Purpose: To improve deliveries to Northeast Shark River Slough in Everglades National Park and reduce seepage to Lower East Coast Service Area 3.

Operation: Redirect Bird Drive Recharge Area flow to Modified L-31N instead of L-29. Redirect S-357 outfall from L-31N to the mid-point of the Modified Water Deliveries (MWD) mitigation canal northwest of the 8.5 Square Mile Area.

Design:        Remove MWD S-356  
                 Relocate MWD S-357  
                 Add S-356 A & B Structures (900 cfs each) at locations along  
                 modified L-31N between G-211 and Tamiami Trail  
                 Reroute L-31N borrow canal to east side of buffer cell  
                 Relocate L-31N to east side of buffer cell  
                 Backfill portion of L-31N where levee moved  
                 5 foot levee along west side of existing lakes

Location: L-31N along east side of Northeast Shark River Slough  
              Counties: Miami-Dade

Assumptions and related considerations:

- 1) Water Quality is not a problem.
- 2) Bird Drive Recharge Area flow is redirected seepage.
- 3) No adverse impacts to areas east of L-31N.

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Component GG4

Geographic Region: Lake Okeechobee

Component Title: Lake Okeechobee Aquifer Storage and Recovery (Lake ASR) –  
SEE COMPONENT FIGURE 1.

Purpose: Provides additional regional storage while reducing both evapotranspiration losses and the amount of land removed from current land use (e.g. agriculture) that would normally be associated with construction and operation of above-ground storage facilities (reservoirs);

Increase the Lake's water storage capability to better meet regional water supply demands for agriculture, Lower East Coast urban areas, and the Everglades;

Manage a portion of regulatory releases from the Lake primarily to improve Everglades hydropatterns, meet environmental targets within the Water Conservation Areas (WCAs), and meet supplemental water supply demands of the Lower East Coast;

Reduce harmful regulatory discharges to the St. Lucie and Caloosahatchee estuaries;

Maintain existing level of flood protection.

Operation: Water from Lake Okeechobee is to be pumped into the Lake Aquifer Storage and Recovery (ASR) wells when the climate-based inflow forecast projects that the Lake water level will rise significantly above those levels that are desirable for the Lake littoral zone (15.25 - 14.85 feet NGVD; Figure 1). During the dry season, flow may be made back to the Lake from the ASR wells either when the Lake water level is projected to fall to within three-quarters of a foot of the supply-side management line the same dry season, or below 11.75 feet NGVD the upcoming wet season. During the wet season, flow is allowed from the ASR wells to the Lake when climate-based inflow forecast projects less than 1.5 million acre-feet of inflow during the next 6 months, and the Lake water level is either below 11.75 feet (NGVD) during the current wet season, or is projected to be in supply-side management during the upcoming dry season.

Design: 1000 MGD total: 200, 5-MGD ASR wells and associated infrastructure

Location: Lake Okeechobee peripheral levee

Assumptions and Related Considerations:

- 1) Current United States Environmental Protection Agency and Florida Department of Environmental Protection regulations require that ASR source



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water meet primary drinking water standards before injection. Lake Okeechobee water is assumed to meet these standards.

- 2) ASRs will have an approximate recovery rate of 70%, i.e. 30% of water injected to the deep wells is lost due to transmission (injection and recovery) and storage (mixing with deep aquifer saline water, migration of ASR storage flume) losses.

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Component HH3

Geographic Region: Central and Southern Everglades, Water Conservation Areas and Everglades National Park (same as Alternatives 3 and 5)

Component Title: Operation Change of S-343 A and B

Purpose: Releases from the southwest corner of Water Conservation Area 3A contributes to the flow in a nesting region of the Cape Sable Sparrow. In order to reduce the potential adverse effects on the nesting season, the S-343 A and B structures will be closed during the January to June time period.

Operation: The new schedule will include releases to achieve NSM water depths except during the months of January to June when the releases are suspended. The suspension of releases will help provide a recession of downstream stages during the nesting season.

Design: No change.

Location: No change.

Assumptions and related concerns:

- 1) ATLSS outputs from Alternative 2 indicated an adverse condition related to increased flows to the western side of the ENP. Although the operational change should improve the conditions for the Cape Sable Sparrow, less flow will be sent to the Lostmans Slough area.

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Component II3

Geographic Region: Everglades Agricultural Area (EAA) - Palm Beach County

Component Title: Pump Station G-404 Modification (same as Alternatives 3, 4 and 5)

Purpose: Increase the capacity of proposed Everglades Construction Project (ECP) pump station G-404 to improve the hydropattern restoration in the northwest corner of Water Conservation Area 3A (WCA 3A) and increase the amount of water available in the west-central region of WCA 3A to reduce dry out periods.

Operation: Pump the maximum Stormwater Treatment Area (STA) 3/4 treated discharge possible across the Miami Canal from the L-5 borrow canal to the L-4 borrow canal to the northwest corner of WCA 3A. The treated discharge will sheet flow across the northern reach of WCA 3A between the Miami Canal and L-28 and flow down the L-28 canal through structure S-140. This additional water should improve the hydropattern restoration and reduce the number of dry out periods in the central region of WCA 3A. This diversion of water from the northeast section of WCA 3A should reduce the inundation duration and extreme high water depths in this sector of the water conservation area.

Design:

Increase the capacity from 1000 cfs to 2000 cfs on this proposed vertical, axial flow, low head, high capacity pump station (may be slightly resized after further hydraulic analyses).

Location: Confluence of Miami Canal, L-5 Borrow Canal and the L-4 Borrow Canal north of the S-8 Pump Station.

Counties : Palm Beach

Assumptions and related considerations:

- 1) Land Availability.
- 2) Compatibility with proposed G-404 design.
- 3) Modifications to the L-4 and L-5 borrow canals if needed to increase the conveyance capacities to handle the additional conveyance.

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Component JJ3

(not included in this Alternative)

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Component KK4

Geographic Region: Water Conservation Area 1

Component Title: Loxahatchee National Wildlife Refuge Internal Canal Structures (same as Alternatives 4 and 5)

Purpose: Improve timing and location of water depths in the Refuge.

Operation: Structures would remain closed except to pass Stormwater Treatment Area (STA) 1 East and STA – 1 West outflow and water supply deliveries.

Design:

- (1) L-7 borrow canal structure: 1500 cfs gravity structure at 0.5 feet of head.
- (2) L-40 borrow canal structure: 1500 cfs gravity structure at 0.5 feet of head.

Location: The L-7 structure is located at cell R28C50 in the L-7 borrow canal within the Loxahatchee National Wildlife Refuge. The L-40 structure is located at cell R34C50 in the L-40 borrow canal within the refuge.

Counties: Palm Beach

Assumptions and related considerations:

- 1) STA discharges to the Loxahatchee National Wildlife Refuge are assumed to be of acceptable water quality.

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Component LL4

Geographic Region: Lower East Coast Service Area 1

Component Title: C-51 Regional Groundwater Aquifer Storage and Recovery (ASR)

Purpose: This is a regional groundwater aquifer storage and recovery system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. The ability to use the recovered water during dry periods will increase regional water resources.

Operation: Water will be captured and stored when water is being discharged out of S-155 to tide. Water will be recovered during dry periods based on canal elevations. Recoverable water is limited to 70 % of injected water.

Design: This component consists of 54 well clusters located along the West Palm Beach Canal (C-51) and the E-4 Canal southward from C-51 to Lake Osborne, each being composed of two (2) surficial aquifer wells and one Upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5 MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide in wet periods. Each upper Floridan aquifer ASR well will have a capacity of 5 MGD. (The total injection and recovery capacity of the ASR system is 270 MGD.) Water will be injected when stages in the C-51 Canal and the E-4 Canal are above 8.0 feet NGVD. Water will be retrieved from the ASR wells when canal stages are below 7.8 feet NGVD. Recovered water will be discharged to the C-51 Canal.

Location: Along the C-51 Canal in Eastern Palm Beach County east of U.S. Route 441.

Counties: Palm Beach

Assumptions and Considerations:

- 1) It is assumed that groundwater ASR in proximity to the C-51 canal is permittable without treatment.

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Component MM4

Geographic Region: Lower East Coast Service Area 1

Component Title: Hillsboro Canal Basin Regional Groundwater Aquifer Storage and Recovery (ASR)

Purpose: This is a regional groundwater aquifer storage and recovery system which will capture and store excess water during wet periods and recover the water for utilization during dry periods. The ability to use the recovered water during dry periods will increase regional water resources.

Operation: Water will be captured and stored when water is being discharged from the coastal Hillsboro Canal basin to tide. Water will be recovered during dry periods based on canal elevations. Recoverable water is limited to 70% of injected water.

Design: This component consists of 22 well clusters located along Hillsboro Canal, each being composed of two (2) surficial aquifer wells and one Upper Floridan aquifer ASR well. The surficial aquifer wells will each have a 2.5 MGD withdrawal capacity and be located in proximity to the canal so that the water withdrawn would result in the interception of water that would otherwise go to tide in wet periods. Each upper Floridan aquifer ASR well will have a capacity of 5 MGD. (The total injection and recovery capacity of the ASR system is 110 MGD.) Water will be injected when stages in the Hillsboro Canal are above 7.1 feet NGVD to 22 wells. When water is available from the Site 1 Reservoir (see Component M) it will be supplied for injection to the remaining 15 wells. Water will be retrieved from the ASR wells when canal stages are below 7.0 feet NGVD. Recovered water will be discharged to the Hillsboro Canal.

Location: Along the coastal reach of the Hillsboro Canal in Palm Beach and Broward Counties

Counties: Palm Beach, Broward

Assumptions and Considerations:

- 1) It is assumed that groundwater ASR in proximity to the Hillsboro Canal is permissible without treatment.

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Component NN3

(not included in this Alternative)



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Component OO4

Geographic Region: South Miami-Dade County

Component Title: Modification to South Dade in Southern Portion of L-31N and C-111 (same as Alternatives 4 and 5)

Purpose: To improve deliveries to Everglades National Park and decrease potential flood risk in the Lower East Coast service area.

Operation: Modify C-111 Canal operations.

Location: South Dade Conveyance System  
Counties: Miami-Dade

Assumptions and related considerations:

- 1) Will not cause adverse impacts to ENP and South Dade Agricultural Lands.
- 2) This component is dependent on Component FF.

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Component PP3

(not included in this Alternative)

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Component QQ5

Geographic Region: Water Conservation Areas and Everglades National Park

Component Title: Decompartmentalization of Water Conservation Area 3 (Same as Alternative 4 with the exception of maintaining WCA-3A levees (L-28 and L-29) and restoring sheetflow from WCA-3B to Northeast Shark River Slough by degrading L-29 south of WCA-3B. The function of the L-67A and C is replaced by a passive weir structure to facilitate high flow sheetflow from WCA-3A to 3B.

Purpose: Remove most flow obstructions to achieve unconstrained or passive flow between Water Conservation Areas 3A and 3B and Northeast Shark River Slough and reestablish the ecologic and hydrologic connection between these areas.

Operation: Rain-driven trigger gages in Northwest Shark River Slough similar to Alternative 3. Sheetflow to Everglades National Park (refer to Component H5 for Everglades Rain-Driven Operations).

Design:

Backfill the Miami Canal from the east coast protective levee to one to two miles south of the S-8 pump station to maintain flood discharge capability.

Remove the L-68A levees (this feature is outside SFWMM model detail).

Degrade the L-67A and C levees and backfill the adjacent borrow canals.

Construct a passive weir structure along the entire length of L-67A to promote sheetflow during high flow conditions and maintain the S-345s (component AA3) for dry season flows to WCA-3B.

Remove eastern portion of the L-29 (south of WCA-3B) to restore sheetflow into Northeast Shark River Slough.

Elevate (bridge) Tamiami Trail (U.S. 41) south of WCA-3B.

Location: Within the existing boundaries of the Water Conservation Areas and Everglades National Park.

Counties: Broward, Miami-Dade

Assumptions and related considerations:

- 1) Potential increases in hydropatterns in dry areas and decrease in hydropatterns in deep water areas.
- 2) Tradeoff between water levels and hydroperiods in central and south central Water Conservation Area 3A and Everglades National Park.
- 3) Additional S-345s are needed to ensure that significant dry season flows into WCA-3B and ultimately Everglades National Park can be achieved.

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Component RR4

Geographic Region: Water Conservation Areas

Component Title: Flow to Central Water Conservation Area 3A (WCA 3A)

Purpose: To increase depths and extend hydroperiods in central WCA 3A.

Operation: Relocate pump station S-140 and distribute flows into central WCA 3A. Pump operation will be driven by target stages at the 3A-4 gage.

Design: Relocate S-140 pump station approximately 8 miles south of its current location and increase the capacity from 1300 cfs to 2000 cfs. A spreader system will be needed to distribute the S-140 discharge via sheetflow.

Location: Within the existing boundaries of the Water Conservation Areas.

Counties: Broward

Assumptions and related considerations:

- 1) Potential increases in hydropatterns in dry areas and decrease in hydropatterns in deep water areas.
- 2) Tradeoff between water levels in indicator regions 18 and 17 in central WCA 3A.
- 3) May require increased flows from Lake Okeechobee to achieve the desired hydropatterns in central WCA 3A.
- 4) Spreader mechanism required at the point where flows will be introduced into WCA 3.

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Component SS4

Geographic Region: Everglades Agricultural Area (EAA) and Miami-Dade County

Component Title: Reroute Miami-Dade County Water Supply Deliveries – SEE COMPONENT MAP 11

Purpose: Reroute water supply deliveries made to Miami-Dade County from the Miami and Tamiami Canals and Water Conservation Area 3 (WCA 3) to the North New River Canal due to the backfilling of the Miami Canal as part of the decompartmentalization of WCA 3.

Operation: Send water supply deliveries from Lake Okeechobee to Miami-Dade County southeast through the North New River Canal in the Everglades Agricultural Area (EAA) (L-20, L-19, L-18) to S-150. From S-150 send deliveries into L-38W and at the southern terminus of L-38W south through a 1500 cfs pump to the borrow canal along the west side of US 27.

Design:

Double the capacity of the North New River Canal south of the proposed EAA Storage Reservoir (see Component G3) to convey additional water supply deliveries to Miami-Dade County as necessary.

Double the capacity of S-351 and S-150 to pass additional water supply deliveries to Miami-Dade County as necessary.

Improve conveyance in the borrow canal on the west side of US 27 between L-38W and the Miami Canal as necessary to pass the additional flows.

Location: EAA and Water Conservation Area 3.

Counties: Palm Beach, Broward, Miami-Dade

Assumptions and related considerations:

- 1) Operational flexibility is reduced since there is only one delivery route to Miami-Dade County (back-up routes have been eliminated).

1500 cfs Inverted Siphon to pass water supply deliveries from L-38 borrow canal to US 27 west borrow canal (improved to pass additional flows). Maintains separation of Lake Okeechobee deliveries and WCA 2 seepage water.

1500 cfs pump and culvert to convey flows generated by both seepage collection and flows above targets in WCA 2B from NNR to the L-37 borrow canal

New levee to be constructed from North New River south to the Miami Canal

## Alternative C North New River Component Map 11

N ↑  
Not to Scale

## WCA-2B









3 structures, 350 cfs at 4 feet of head, (S-141 A, B, C) to pass flows greater than targets to NESRS and/or CLBS via improved conveyance of NNR, L-37 and L-33 canals.

Basin Divide structure to separate WCA-2B flows directed south

US 27 west borrow canal

Basin Divide structures to separate WCA -2B flows directed south. 500 cfs structure to be used for water supply releases to Broward County

### LEGEND

	Existing Canal		Improved Canal
	Existing Levee		New Levee
	Existing Water Control Structure		New Culvert
			New Water Control Structure

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Component TT4

(not included in this Alternative)

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Component UU6

Geographic Region: St. Lucie River Estuary/C-23, C-24, Northfork and Southfork Basins

Component Title: Storage Reservoirs (modified from Alternative 5 – operational change and larger, shallower reservoir in the Southfork Basin)

Purpose: Storage reservoirs to capture local runoff from the C-23, 24, and Northfork and Southfork Basins of the St. Lucie River Estuary. The reservoirs will be designed for flood flow attenuation to the estuary, water supply benefits including environmental water supply deliveries to the estuary, and water quality benefits to reduce salinity and nutrient impacts of runoff to the estuary. There is one reservoir in each basin.

Operation:

Inflows from C-23, C-24 and Northfork and Southfork of the St. Lucie River.

Design:

A total of 20200 acres at 8 feet maximum depth distributed as follows among these basins: C-23 – 6500 acres, C-24 – 4600 acres, Northfork – 9100 acres. In the Southfork Basin storage requirements were met using 15000 acres inundated to a depth of 2 feet.

Inflow pump capacity = 1.5 inches per day

Outflow structure capacity = TBD (initially assumed to not constrain performance)

Location: To be determined – Specific site not necessary for Water Management Model simulation.

Counties: Martin and St. Lucie

Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Potential water quality benefits by reducing nutrient and sediment loading to the estuary.



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Component VV5

Geographic Region: Central Eastern Palm Beach County

Component Title: Palm Beach County Agriculture Reserve Reservoir (modified from Alternative 4 to include Aquifer Storage and Recovery (ASR)) – SEE COMPONENT MAP 12

Purpose: Increase water supply for central and southern Palm Beach County by capturing and storing water currently discharged to tide.

Operation: The reservoir will be filled during the wet-season from excess water pumped out of the western portions of the Lake Worth Drainage District (LWDD) (backpumped). Water will be released back to LWDD to maintain canal stages during the dry-season. As with the base cases and the previous alternatives regional water will be supplied to the LWDD when water levels fall below 15.8 feet NGVD. Water will be backpumped into the reservoir when water levels are above 16.00 feet NGVD. Aquifer Storage and Recovery (ASR) is being incorporated to improve efficiency. Fifteen (15) 5 MGD capacity ASR wells will be added for this alternative (total injection and recovery capacity of 75 MGD). Water from the reservoir will be injected when depths in the impoundment are above 1 foot. Water will be supplied from the reservoir before tapping water from Aquifer Storage and Recovery (ASR) systems. Specifically, the water supplied from the reservoir will be maximized (up to the outflow capacity) before water is supplied from ASR storage.

Design:

1660 acres with a maximum depth of 6 feet

Inflow pump capacity = 500 cfs (provided by two 250 cfs pumps)

Outflow structure capacity = 500 cfs @ 6 feet of head

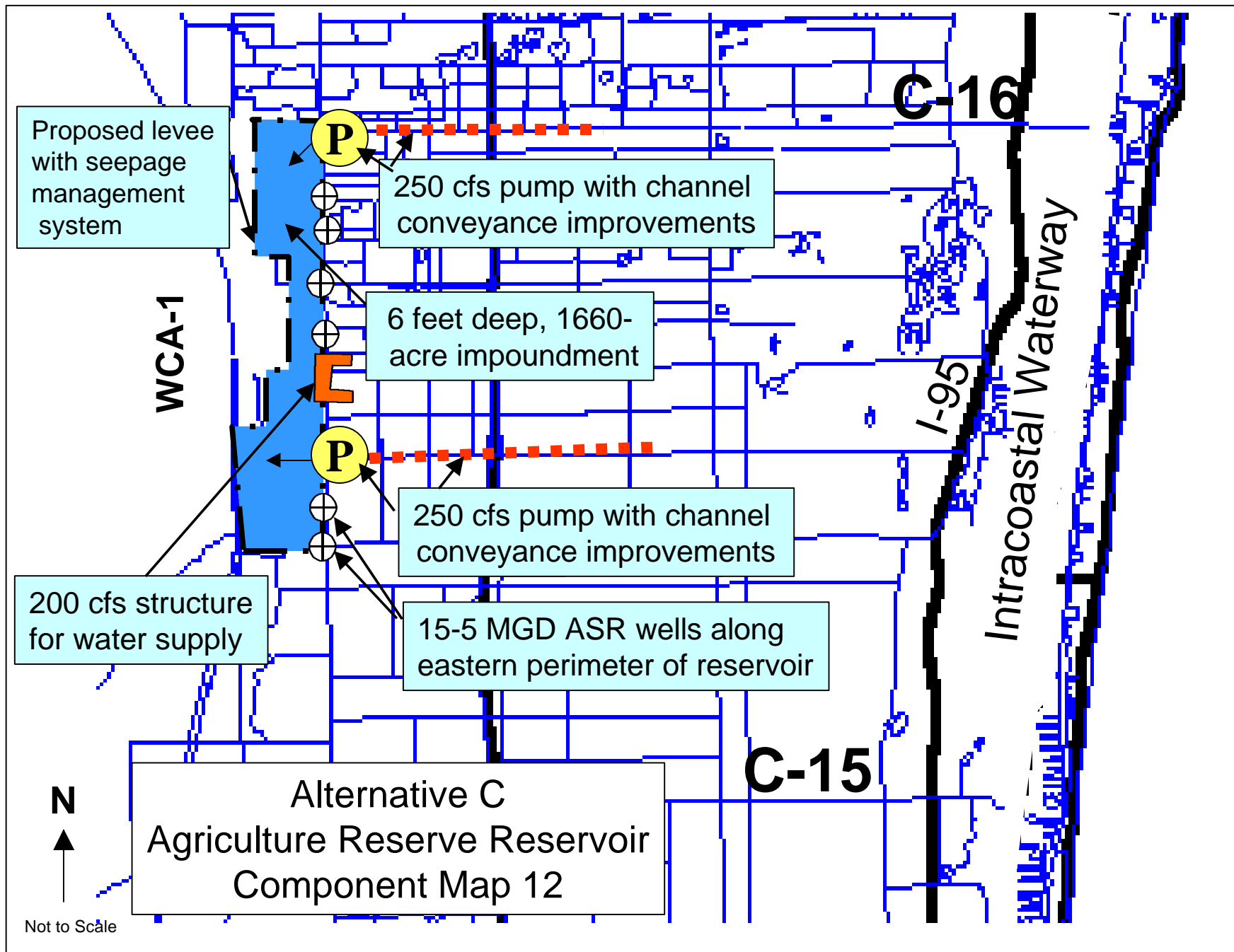
Fifteen (15) – 5 MGD ASR wells (total capacity 75 MGD)

Emergency outflow structure = 300 cfs

Location: The western portion of central Palm Beach County.  
Counties: Palm Beach

Assumptions and related considerations:

- 1) Excess storage could be discharged to the LWDD during off peak times.
- 2) Canal conveyance improvements for two laterals from E-1 to the E-2.
- 3) No operation changes in the LWDD.



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Component WW5

Geographic Region: South Dade County

Component Title: C-111N Spreader Canal (modified from Alternative 4 to extend C-111N east of Card Sound Road) – SEE COMPONENT MAP 13

Purpose: To reduce wet season flows in C-111, improve deliveries to Model Lands and Southern Glades and decrease potential flood risk in the lower south Dade area.

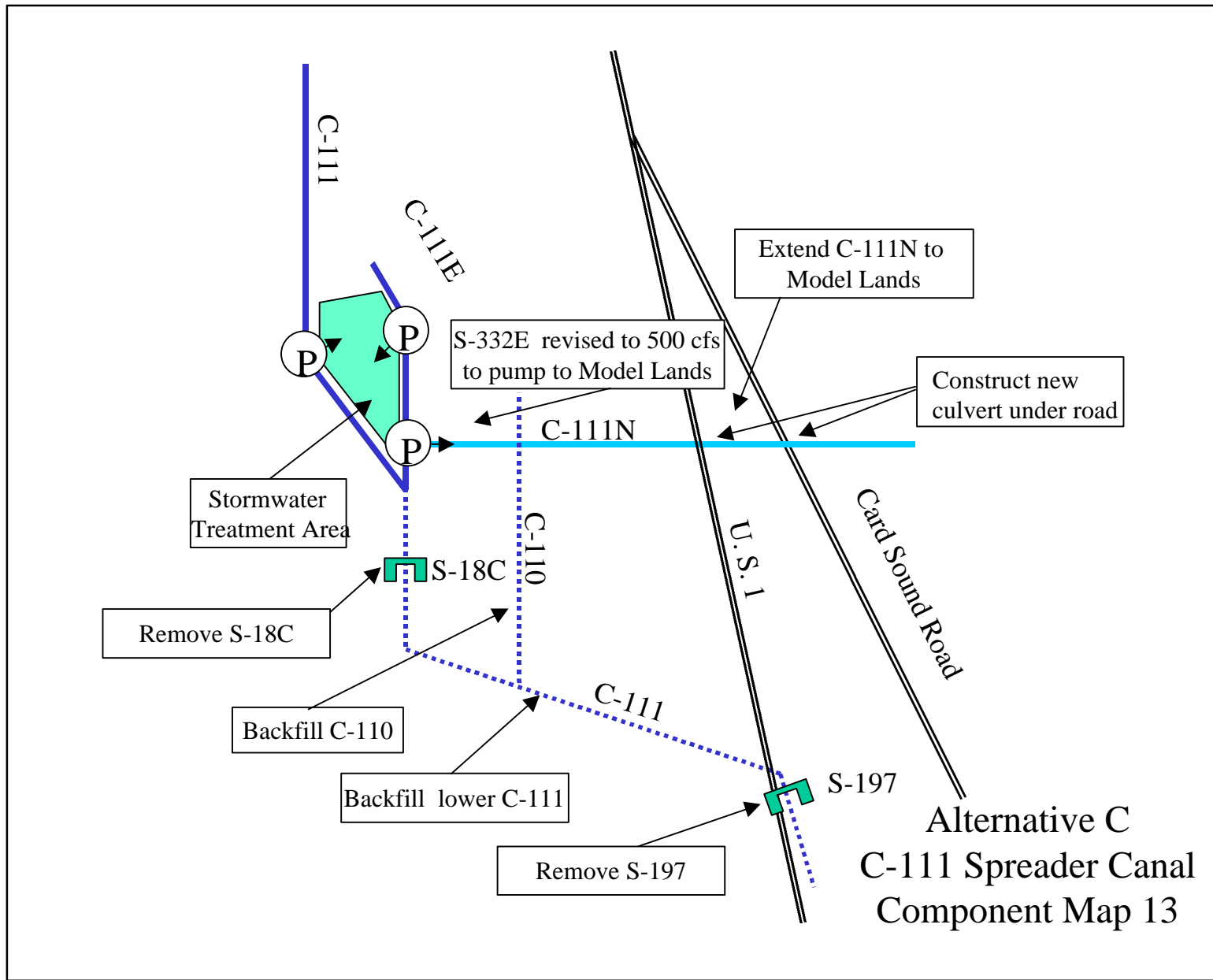
Operation: Water is pumped from C-111 and C-111E into a Stormwater Treatment Area (STA) prior to pumping through S-332E into C-111N to Southern Glades and Model Lands. S-197 and S-18C are removed and C-111 is backfilled.

Design: Increase S-332E to 500 cfs from 50 cfs (pump when available).  
Relocate C-111N to SW theoretical 440th street (approximately 1 section north ).  
Culvert under US 1.  
Culvert under Card Sound Road.  
Canal through triangle area of Model Lands, east of Card Sound Road.  
Fill in C-111 south of confluence with C-111N to S-197.  
Remove levees and access roads.  
Completely backfill C-110.  
Create STA in triangle land between C-111 and C-111E to clean water prior to putting in Model Lands.

Location: South Dade Conveyance System  
Counties: Miami-Dade

Assumptions and related considerations:

- 1) Will not cause adverse impacts to South Miami-Dade Agricultural and Urban Lands.
- 2) Assume clean water from C-111 and C-111E



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Component XX5

Geographic Region: Water Preserve Area - Miami-Dade County

Component Title: North Lake Belt Storage Area (modified from Alternative 4 to include capturing additional C-6, C-11 and C-9 runoff) - SEE COMPONENT MAP 6

Purpose: In-ground reservoir to capture a portion of runoff from C-6, western C-11 and C-9 Basins. The in-ground reservoir with perimeter seepage barrier will allow storage of untreated runoff without concerns of ground water contamination. The stored water will be used to maintain stages during the dry season in the C-9, C-6, C-7, C-4 and C-2 Canals.

Operation: Inflows from C-6 (west of the turnpike), western C-11, and C-9 basin runoff are pumped and gravity fed into the in-ground reservoir. Inflow ceases when stages reach ~5.0 feet NGVD (0 feet above adjacent land elevation).

Outflows for water supply are pumped to the C-9 Storm Water Treatment Area (STA)/Impoundment prior to delivery to the C-9, C-6, C-7, C-4 and C-2 Canals.

Water from the reservoir can be withdrawn down to a stage of -15 feet NGVD (up to 20 feet of working storage & maximum head on seepage barrier).

The storage area is increased from 3500 acres to 4500 acres to capture a greater portion of runoff from C-6, C-9 and C-11 basins. (Note: SFWMM simulation assumes 5120 acres of surface area. To simulate equivalent working storage volumes, the simulated water levels are higher from those prescribed here.)

**Design:**

Reservoir: 4500 acres with subterranean seepage barrier around perimeter to enable drawdown during dry periods, prevent seepage and to prevent water quality impacts.

Inflow Structures: 2500 cfs gravity structure @0.5 feet of head, from C-11W  
600 cfs pump from C-9  
300 cfs pump from C-6 west of divide structure

Outflow Structures: 1000 cfs pump to C-9 STA/Impoundment for treatment prior to deliveries to C-6, C-7, C-2, C-4 and C-9 to prevent saltwater intrusion in coastal canals. (Stormwater Treatment Area detention time requirements need to be addressed. Pretreatment in reservoir may reduce size requirements of treatment area).

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Canal: 800 cfs canal capacity - Water supply discharges are routed to C-4/C-2 via a canal to be located east of the Snapper Creek canal (Northwest wellfield protection canal system). 2-1400 cfs delivery structures, one each at the new canal's confluence with C-6 and C-4. SEE COMPONENT MAP 6

Location: Reservoir would be located within the area proposed for rock mining by the Lake Belt Issue Team. It would be sited north of Miami Canal (C-6) and South of the C-9 Canal to minimize impacts to the Northwest wellfield.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) No adverse effect of a subterranean wall on Miami-Dade County's NW wellfield
- 2) Treatment facility needed if stored water is backpumped to the Everglades.
- 3) All water quality considerations will be addressed regarding releases from the reservoir to the water supply wellfields.
- 4) Impacts on the cone of influence of the Northwest Wellfield and its effect on wetland mitigation around the wellfield.
- 5) Limestone Filter Treatment system within the Reservoir may be developed through use of compartmentalization of rockmining excavation pattern.
- 6) Telemetry systems will be required for all operable structures and pump stations.
- 7) Any specific water quality considerations regarding capture of C-6 basin runoff will be addressed during the detailed design stage.

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Component YY4

Geographic Region: Water Conservation Area -Water Preserve Area - Lake Belt

Component Title: Divert WCA2 flows to Central Lake Belt Storage - SEE  
COMPONENT MAP 11

Purpose: Capture excess in Water Conservation Area 2B (WCA 2B) to reduce stages above NSM in Water Conservation Area 2B and to divert water through improved L-37 and L-33 Borrow Canals to 1) North East Shark River Slough (NESRS) to meet targets or 2) Central Lake Belt Area for deliveries to NESRS, or 3) when available to meet Snapper Creek demands and 4) to maintain Dade-Broward levee at 5.0 feet NGVD.

Operation: Surface water in WCA 2B above NSM will overflow through 3 structures along L-35 and L-35A to North New River Canal along with seepage from WCA 2B and pumped to L-37. North New River Canal, L-37 and L-33 Borrow Canals will be improved to accept this additional flow along with the seepage collected from WCA 3. This water will be pumped to North East Shark River Slough (NESRS) if the Slough is below target levels **or** into a lined reservoir south of the confluence of L-33 and the C-6 Canal referred to as the Central Lake Belt Storage Area (CLBSA) SEE COMPONENT S. Water in the CLBSA will be used to 1) meet NSM targets in NESRS, 2) provide water for Snapper Creek Canal and 3) provide water to the Dade-Broward Levee to maintain 5.0 feet NGVD.

Design:

- (1) 3- diversion structures with 175 cfs capacity @0.5 feet of head and 500 cfs capacity @4.0 feet of head along the southern perimeter of WCA 2B
- (2) Intermediate 1500 cfs pump station to divert overflow and seepage from NNR to L-37
- (3) Improved conveyance of L-37 and L-33 to 3000 cfs to handle WCA 2B flows plus seepage from WCA 3
- (4) Remove S-9XN and S-9XS or improve structures to accommodate increased flows.

Location: The overflow structures are located along the southern levee of WCA-2B. L-37 and L-33 Borrow canal improvements are located east of the Protective levees and 0.5 miles west of US 27 between North New River Canal and the Miami Canal.

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Counties: Broward

Assumptions and related considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations.



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*C&SF Comprehensive Review Study - Alternative C*

Component ZZ5

Geographic Region: Water Conservation Area -Water Preserve Area - Lake Belt

Component Title: Divert WCA 3 flows to Central Lake Belt Storage Area - SEE COMPONENT MAP 6

Purpose: Capture excess in Water Conservation Area 3A (WCA 3B) and WCA 3B to reduce stages above target stages in Water Conservation Area 3 and to divert water through modified structures at S-9 and S-31 to Central Lake Belt Storage Area via the L-33 borrow canal.

Operation: When surface water in WCA 3B exceeds NSM by 0.25 feet NGVD it will be diverted to the Central Lake Belt Storage Area via L-33.

Design:

Outflow Structures - 500 cfs structure at S-9 (WCA 3A) (new structure)  
700 cfs structure (existing S-31) (WCA 3B) (modified if necessary)

Location: The eastern levees of WCA 3.

Counties: Broward and Miami-Dade

Assumptions and related considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations

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Component AAA6

Geographic Region: Lower East Coast Service Areas

Component Title: Lower East Cost (LEC) Water Conservation

**Purpose:** The purpose of this component is to reduce the demands of public water supply through the full implementation of the South Florida Water Management District's mandatory water conservation program. The regional affect from the implementation of water conservation would include greater efficiency of the water utilized by public water supply utilities and a year round reduction of the volume of water delivered from the regional water resource facilities to recharge coastal canals and wellfields.

**Operation:** A five percent reduction in withdrawals will be applied to each utility within each service area evenly over each month of the simulation period. The percentage reduction will be based on the anticipated water conservation measures for each of the service areas.

**Design:** The current mandatory water conservation program of the SFWMD was applied throughout the service area to the public water supply demand projections using IWR-Main forecasts. The percentage reduction is a result of the conversion of residential end users to ultra-low flow fixtures and daytime restrictions on lawn watering throughout the service areas, both practices are required by existing regulations. The percentage of the population using water-conserving fixtures is increased thereby reducing public water supply demands when compared to the 2050 Base. The percentage reduction is calculated from the 2050 Base that contains a moderate application of conservation techniques. The reduction applied in this component assumes full implementation of the District's water conservation program.

The 2050 Base utility demands in the Lower East Coast Service Area were reduced by 5% in this Alternative.

**Location:** Lower East Coast

Counties: Palm Beach, Broward, Miami-Dade

**Assumptions and related considerations:**

- 1) Water conservation measures apply to all sources of water. It is most likely that demands met by reuse water would not be affected by restrictions in irrigation.

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Component BBB6

Geographic Region: Southern Miami-Dade County

Component Title: South Miami-Dade County Reuse (South District Reclaimed Water Treatment Plant) (modified from Alternative 5 to send water northward to the C-100 Canal) - SEE COMPONENT MAP 14

Purpose: The existing South District Wastewater Treatment Plant (SDRWTP) located north of the C-1 Canal will provide wastewater treatment coupled with superior treatment technology to supply reclaimed water to the South Biscayne Bay and Coastal Wetlands Enhancement (SBBCWE) Project. The water will be provided throughout the year to augment water supply to the SBBCWE upon demand. This supplemental water will restore overland flow in the coastal area and recharge groundwater to enhance groundwater discharge to Biscayne Bay. Saltwater intrusion benefits to the southern part of Dade County are anticipated.

Operation: The SDRWTP with superior treatment technology will be operated when the additional water is needed to supply the SBBCWE. When water is not needed, the SDRWTP will stop treatment beyond secondary treatment standards and will dispose of the secondary treated effluent into the existing deep injection wells.

Design: The SDRWTP will be designed to add on pretreatment and membrane treatment system to the existing secondary treatment facility. The plant will have a capacity of 131 MGD. It is anticipated that phosphorus will be the constituent of concern in the reclaimed water. Therefore, the treatment will be designed to remove total phosphorous to acceptable levels.

The SDRWTP will be located at, or in the vicinity of, the existing SDRWTP. The reclaimed water will be discharged to the C-1 Canal (Black Creek), upstream of S-21A, and then delivered southward towards the C-102 and C-103 canals, and northward towards the C-100 canal. The wastewater treatment facility will provide advanced treated water to L-31E. Flow southward in L-31E towards C-102 and C-103 shall be 202 acre-feet per day. Flow northward in L-31E towards C-100 shall be 200 acre-feet per day (through a canal extension). The combined inflow into L-31E shall be 402 acre-feet per day for every day of the simulation. Flows will reach C-102 and C-100 via modifications to L-31E as shown on Component Map 14. Operation of C-102 and C-103 shall be contingent upon Component FFF5.

Location: Miami-Dade County

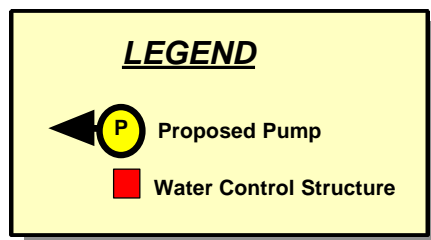
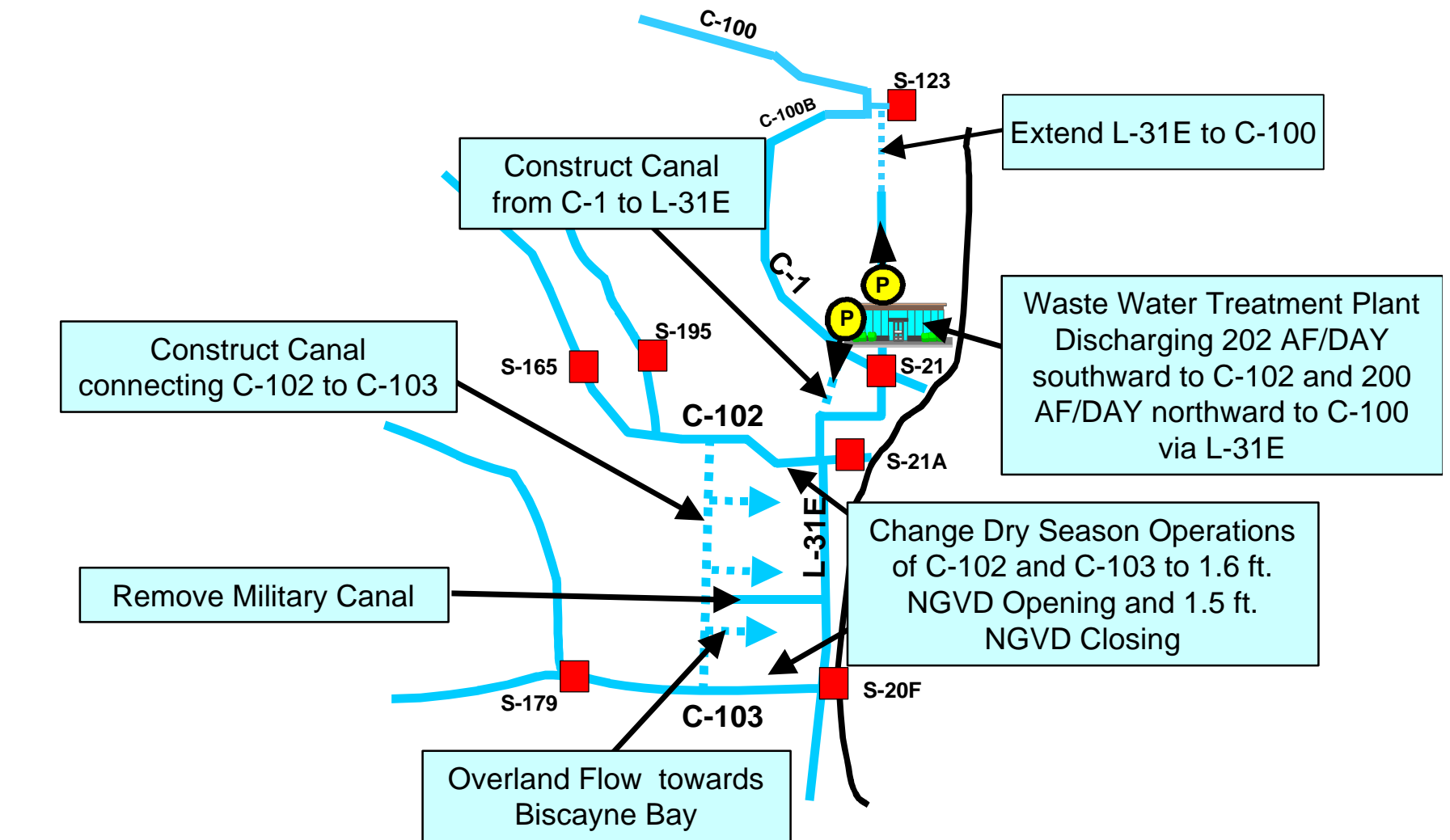
Assumptions and other considerations:

- 1) The reuse facility uses advanced treatment resulting in water quality acceptable to the Bay.
- 2) No adverse impacts to adjacent agricultural or urban areas.

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*C&SF Comprehensive Review Study - Alternative C*

- 3) Discharge capacity at S-123, S-20F, S-21 and S-21A is sufficient to pass basin runoff and inflows from the reuse facility during storm events.
- 4) This component is dependent on Component FFF.



Alternative C  
South Biscayne Bay and Coastal  
Wetlands Enhancement  
Component Map 14

**-Draft-**  
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Component CCC6

Component Title: Big Cypress/L-28 Interceptor Modifications (revised from Alternative 5 to allow for compliance with Seminole Tribe's Conceptual Water Conservation System master plan– SEE COMPONENT MAP 15)

Component Title: Big Cypress/L-28 Interceptor Modifications – SEE COMPONENT MAP 15

Purpose: Alleviate over drainage in Northeast Big Cypress, Kissimmee Billy and Mullet Slough area and ensure that inflows meet applicable water quality standards.

Operation: Reroute water from West and North Feeder Canals to wetlands in Northeast Big Cypress. Allow flow along the south side of the West Feeder at designated locations and through a new S-190 Pump Station, while maintaining flood protection on Tribal lands and consistency with the Seminole Tribe's Conceptual Water Conservation System master plan. Establish sheetflow south of the West Feeder Canal across the Native Area of the Big Cypress Reservation. Establish sheetflow off the reservation in the Big Cypress National Preserve Addition. Operate pumps for approximate equalization of flows.

Design:

- Degrade the levee on the SW side of the L-28 Interceptor canal below the S-190 structure.
- Backfill the L-28 Interceptor canal at a point south of the Big Cypress Reservation boundary with Big Cypress National Preserve Addition.
- Retain levee on NE side of L-28 Interceptor through the Big Cypress Seminole Reservation.
- Develop sheetflow along the south side of the West Feeder Canal through three pump stations and spreader canals. The pump station locations shall be adjacent to the discharge points from Water Recovery Areas 1, 2 and 3 of the Seminole Conceptual Water Conservation System.
  - Pump station at WRA-1 discharge: 250 cfs
  - Pump station at WRA-2 discharge: 500 cfs
  - Pump station at WRA-3 discharge: 750 cfs
- Replace S-190 gated structure (existing capacity of 2960 cfs) with a 1460 cfs pump station.
- North Feeder stormwater treatment area: 1100 acres at 4-foot maximum depth.
  - Inflow pump station: 270 cfs
  - Outflow structure: 100 cfs
- West Feeder stormwater treatment area: 800 acres at 4-foot maximum depth.
  - Inflow pump station: 430 cfs
  - Outflow structure: 150 cfs

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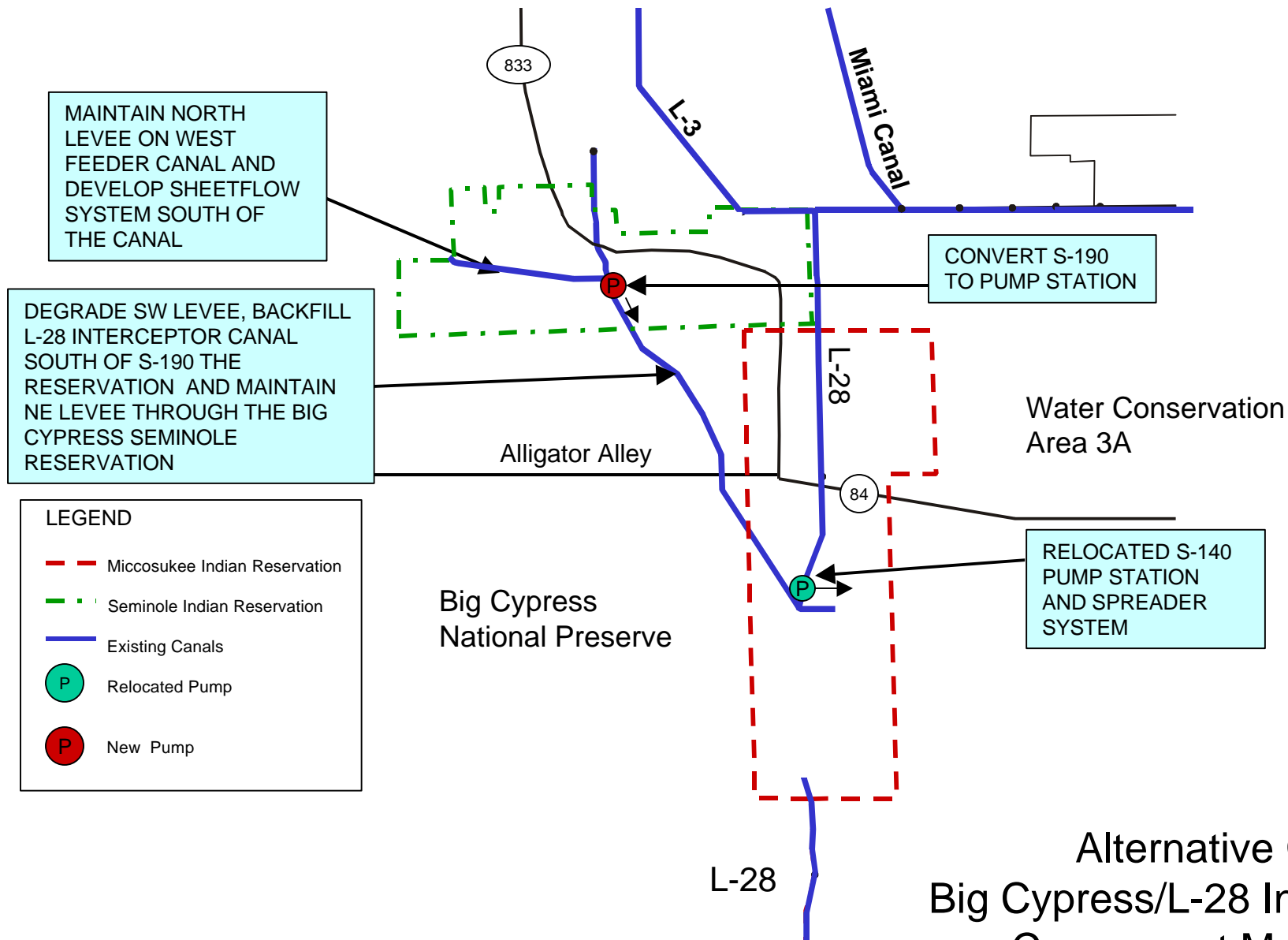
Location: Western Basin, Big Cypress Seminole Reservation, Big Cypress  
National Preserve Addition

Counties: Hendry, Collier, Broward

Assumptions and Related Considerations:

- 1) Water quality treatment for runoff entering the West and North Feeder Canals is provided by stormwater treatment areas, if necessary, to meet applicable water quality standards.
- 2) Design shall be consistent with the Seminole Tribe's Conceptual Water Conservation System master plan.
- 3) Existing flood protection shall be maintained.
- 4) Evaluation of flow changes in the area south of the West Feeder Canal and S-190 shall be accomplished by assessing impact on Seminole Tribe's passive use rights.
- 5) Evaluation of flow changes reflects minimal impact.
- 6) Component construction occurs after completion of the Seminole Conceptual Water Conservation System.

# Everglades Agricultural Area



N  
↑  
Not to Scale

Alternative C  
Big Cypress/L-28 Interceptor  
Component Map 15



**-Draft-**  
*C&SF Comprehensive Review Study - Alternative C*

Component DDD5

Geographic Region: Caloosahatchee/C-43 Basin

Component Title: Caloosahatchee Backpumping with Stormwater Treatment Area (STA) – (same as Alternative 5)

Purpose: Capture excess C-43 basin runoff to augment the regional system. These facilities will be designed to backpump excess water from C-43 to Lake Okeechobee after treatment through an STA.

Operation: This component operates after Estuary and Agricultural/Urban demands have been met in the C-43 basin and when water levels in the C-43 storage reservoir (Component D5) exceed 6.5 feet. When this situation occurs, water will be released from the reservoir and delivered to the STA at the capacity of the backpumping/treatment system (2000 cfs). The STA water is then backpumped to Lake Okeechobee. An additional requirement for the backpumping to take place is that Lake Okeechobee must be considered to have available storage, i.e. when its levels are below the pulse release zone line shown on Figure 1.

Design: The key components in the design are pumps and a stormwater treatment area. For the design it has been assumed that the STA is located adjacent to Lake Okeechobee. Because it is not known where the reservoir will be located relative to the STA, it has been assumed that water to be delivered to the STA will be released from the reservoir to the Caloosahatchee River and then pumped from the River into the STA. Since no pump to bring water from the lower Basin (below S-78) to the upper basin has been included in the reservoir design and since most of the basin runoff is generated in the lower basin, a pump to bring the water from the lower Caloosahatchee basin to the upper basin has also been included. The STA has been included to meet the anticipated need to improve the quality of the water before it enters Lake Okeechobee. Finally, a pump station will be used to lift the water from the STA to Lake Okeechobee.

Pumps: 1 pump of 2000 cfs capacity to take water from the lower Caloosahatchee Basin to the upper Caloosahatchee Basin; 1 pump of 2000 cfs capacity to take water from the Caloosahatchee River into the STA; and 1 pump of 2000 cfs capacity to discharge water from the STA to Lake Okeechobee.

STA: an STA of approximately 5000 acres is proposed to achieve water quality improvements.

Location(s) TBD - Specific site not necessary for simulations.

Counties: Hendry, Glades

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Assumptions and related considerations:

- 1) Uncertainty in land availability.
- 2) Water quality benefits to the Lake.
- 3) The Franklin Lock and Dam S-79 time series flow demand for the Caloosahatchee Estuary has been reduced. The Performance Measures were not changed.
- 4) The model assumes that the backpumping/treatment facility, primarily the STA, functions as a flow-through system.

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Component EEE5

Geographic Region: Water Conservation Area -Water Preserve Area - Lake Belt

Component Title: Flows to Eastern Water Conservation Area (WCA) 3B from Central Lake Belt Storage Area - SEE COMPONENT MAPS 6 and 11

Purpose: Captured excess surface water and seepage from Water Conservation Area 2B, 3A and 3B in Central Lake Belt Storage Area (CLBSA) delivered to eastern WCA 3B during dryouts.

Operation: Deliveries will be made to maintain 6 inch depths in WCA 3B if NSM hydroperiod indicate WCA 3B water levels should be at or above 6 inches and water is available in CLBSA. Deliveries from CLBSA will occur through a wetland treatment cell and the L-30 borrow canal to a spreader swale system in the eastern areas of WCA 3B.

Design:        500 cfs pump from L-30 to eastern portion of WCA 3B.  
                    Spreader Swale along eastern WCA 3B to convert 500 cfs to sheetflow  
                    Upgrade of 1500 cfs from CLBSA deliveries NESRS to 2000 cfs to accommodate additional flows to WCA 3B (also seen in component S5)

Location: The discharge point from L-30 borrow canal to WCA 3B is at the bend in the canal and is approximately 4.5 miles south of the intersection of the L-30 and the C-6 Canal.

Counties: Miami-Dade

Assumptions and related considerations:

- 1) Prioritization of use of Central Lake Belt Storage Area water.
- 2) Telemetry systems will be required for all operable structures and pump stations.

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*C&SF Comprehensive Review Study – Alternative C*

Component FFF5

Geographic Region: Biscayne Bay Coastal Canals

Component Title: Biscayne Bay Coastal Canals – SEE COMPONENT MAP 14

Purpose: Maintain higher stages in C-102 and C-103 for urban and environmental water supply.

Operation: Maintain canal stages in C-102 and C-103 with water provided from local sources. Wet season operation for C-102 between S-21A and S-195 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) and for C-103 between S-20F and S-179 (open at 2.2 feet NGVD, close at 2.0 feet NGVD) will remain unchanged. Dry season operation of C-102, between S-21A and S-195, and C-103 between S-20F and S-179, will both change from opening at 1.4 feet NGVD and closing at 1.2 feet NGVD to opening at 1.6 feet NGVD and closing at 1.5 feet NGVD. A borrow canal will be constructed west of L-31E which directly connects the downstream reach of C-102 with C-103 to maintain levels in the lower reaches of C-103.

Design: 3.5 mile connection canal

Location: Biscayne Bay Coastal Canals  
Counties: Miami-Dade

Assumptions and related considerations:

- 1) Local water source tied to Component BBB5, water reuse.
- 2) Component simulates overland flow to Biscayne Bay. South Biscayne Bay Coastal Wetlands Components will be included as part of Other Project Elements, since their effect is not measurable with current modeling techniques. The intent of these components is to restore overland flow and groundwater seepage to Biscayne Bay while reducing the frequency of point-source discharges.

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*C&SF Comprehensive Review Study – Alternative C*  
Component GGG  
(not included in this Alternative)

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*C&SF Comprehensive Review Study – Alternative C*  
Component HHH  
(not included in this Alternative)